GUIDELINES FOR EARTS SYSTEM INTEGRATION AND SYSTEM SHAKEDOWN TESTING

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DEPARTMENT OF TRANSPORTATION
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FOREWORD

This document is intended as a guideline in developing specific site plans for EARTS system integration and shakedown testing. This document is based upon the requirements of NAS-MD-1000 (Plans and Specifications for System Integration and System Shakedown Testing) but adapted to EARTS configuration and operations. It should facilitate an understanding of EARTS test criteria, scope of testing, test objectives and the relationships for EARTS system integration and system shakedown testing management. Guidance on preparation for ORD and operations changeover is also provided. This document is to serve as a convenient reference only and does not supercede or replace the proper function of appropriate directives.

This system integration and shakedown guideline document for EARTS was made possible by significant contributions from cognizant offices of the Air Traffic Service.

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SECTION I

TEST PLAN

1.0 GENERAL

1.1 Purpose

This Test Plan provides guidance for the orderly implementation of the En Route Automated Radar Tracking System (EARTS). This document addresses the System Integration and System Shakedown phases of testing, and provides for transition from one system of processing to a more sophisticated level.

The Test Plan in conjunction with the Test Specification contained in Section II of this document establishes the test criteria, scope of testing, test objectives, and applicable areas of evaluation for completion of System Integration and Shakedown of the EARTS.

1.2 Scope

This document contains adequate information on test management, test planning, test conduct, test evaluation, and test reporting to enable the Facility Integration Group (FIG) to prepare mission test orders and schedules for completion of System Integration and System Shakedown.

1.3 Concept

The Test Plan and Test Specifications are designed to provide for the implementation of the EARTS system.

This plan provides for the completion of System Integration and System Shakedown in accordance with the individual site implementation plan.

1.4 Consideration and Constraints

1.4.1 Building and Equipment Modification

Building and equipment modifications and equipment relocation must be considered in determining the time required for Integration and Shakedown of the System. In some instances a temporary loss of automated capability may be necessary.

1.4.2 Personnel and Workload

Due to the variations in center staffing and traffic conditions, test management must carefully analyze the time necessary for gaining the required and desired levels of personnel proficiency.

1.5 System Integration (SI)

System Integration provides for the merging of the hardware, software, and personnel subsystem (including operational procedures) into the system configuration desired for operations. It affords the opportunity during the implementation process whereby personnel proficiency, operating procedures, and hardware/software processing functions are thoroughly tested, evaluated, and refined prior to the progression to live System Shakedown testing. System Integration will not involve the actual control of air traffic. The simulated traffic should approximate, as nearly as possible, the normal traffic activities experienced by the facility. The use of real time online radar inputs, as well as recorded real time online radar data, may be required for certain surveillance testing.

1.5.1 Relationship to other Testing

1.5.1.1 Hardware

The DPS and other subsystems will have undergone extensive testing and evaluation during Factory Onsite Testing (FOST) and System Onsite Testing (SOST). While testing prior to System Integration is extensive, it is possible that deficiencies in the hardware may not be identified until system operations are begun. Hardware deficiencies identified during System Integration may require reevaluation of the equipment using portions of previously completed tests. It should not, however, be necessary to reexecute the entire test effort in order to proceed with planned testing.

1.5.1.2 Software

1.5.1.2.1 Program Acceptance

It is anticipated that deficiencies in the software (program and data base) may not appear until SOST is completed and System Integration or System Shakedown has begun. Repetition of certain SOST type testing may be required in order to verify corrections. Only the portion of testing required to reevaluate the affected functions should be repeated. Initial planning for all test phases should anticipate limited retesting of this nature.

1.5.1.2.2 Adaptation

Modification and updating of adaptation data will be required during System Integration. Test planning should allow for the careful reevaluation of the program following any adaptation changes prior to activating the new data for use in System Integration.

1.5.1.2.3 Baseline

Baseline testing provides for thorough, fast analysis and evaluation of program functions following changes in the Data Base.

The Baseline must be carefully constructed and maintained by the facility Data System Specialists and System Performance Specialists to provide adequate exercise of all program and I/O functions.

The Baseline should serve as the foundation for all simulation and "scripting" during System Integration and System Shakedown. Any changes to the program and especially adaptation should be scrutinized to determine if additions, deletions, or changes are required in the Baseline.

1.5.1.2.4 NAS Operational Support System

Generation of new system tapes will at times require modification of the Support System Programs. Changes to these programs must be analyzed in order to determine whether modification to locally developed "Test Tools" will be required. Once again, accurate time requirements for familiarization with new tapes should be a normal "fall-out" of SOST.

1.5.1.3 Personnel

System Integration includes the production, application, and validation of operational procedures. This will include the modification of existing procedures and the formulation of entirely new procedures for both Air Traffic (AT) and Airways Facility (AF) personnel.

Where possible, the production of operational procedures should occur prior to System Integration. The validation, refinement, and application technique is a natural fall-out of the SI test effort.

1.5.2 Operational Demonstration (OD)

Prior to completing the personnel subsystem integration with the Hardware and Software, and prior to the completion of System Integration, the accuracy and adequacy of the system will be demonstrated which will exercise all program functions and I/O subsystems applicable to the system being implemented.

At the first site, a formal OD demonstration will be scheduled for the Director, ATS, AFS, and Region or their designated representative. At all follow-on sites, a formal demonstration may be scheduled at the discretion of the Regional Integration Group (RIG).

In lieu of a formal demonstration, notification by the RIG that OD has been satisfactorily completed, will be accomplished as specified in paragraph 3.1.3.2.

1.5.3 Test Methods

Numerous methods for conduct of System Integration have been employed by the several facilities involved in NAS implementation. Some of the methods employed are described here for consideration by the individual ARTCCs. It is not the intent to specify use of a particular approach to testing; methods must by necessity be determined by the individual FIG.

Certain testing may lend itself to one method, while other tests may be more easily accomplished using another method. The Test Procedures provide for use of the most advantageous and effective method on an individual test basis.

1.5.3.1 Parallel Operations

The parallel operations method of System Integration requires the processing of data by the automated system without disrupting the "ongoing" operation. In this way, output from the new system can be compared to the output of the operational system.

1.5.3.1.1 Advantages

The parallel method provides an accurate evaluation of the "new" system, with minimal disruption of the ongoing operation. The method provides for the smoothest transition from one system to another.

1.5.3.1.2 Disadvantages

Personnel and Hardware (when both systems are automated) required for parallel operations, generally exceed the resources available.

The total workload required to make this method effective is essentially twice that generated by normal operations.

Difference in formats, which exist between various program models and versions, complicate operational use.

1.5.3.2 Centralized and/or Blocked Output Method

Centralized - This refers to the restricting of I/O within the control room to a few devices located in a common area.

1.5.3.2.1 Advantages

This method creates minimal disruption of control room activities. Centralized operations require a limited number of test participants. This method is a rapid and effective means of "on-the-spot" evaluation and analysis of output.

Centralized provides the easier and most effective control of input and evaluation of personnel proficiency.

1.5.3.2.2 Disadvantages

Centralized requires operating procedures which may conflict with procedures for normal configuration.

1.5.3.3 Procedurally Limited I/O Method

This method enables the gradual activation of program functions by procedurally limiting the type of input during specific tests or series of tests.

1.5.3.3.1 Advantages

Test procedures using this method most nearly emulate operational procedures.

The procedurally limited I/O method allows maximum involvement of operations personnel throughout testing. This method allows the most rapid operational use of output.

1.5.3.3.2 Disadvantages

Procedural limits on input are difficult to control; therefore, maintenance of a "sterile" test environment is exceedingly difficult. Analysis of test output and results is more difficult than with other methods.

1.5.3.4 Serial Method

The Serial Method of System Integration may be the most practical method when a new program is to be implemented at a facility having an existing automated operation. At a predetermined time of day the ongoing automated operation is terminated and the system is reconfigured to support the required testing. A manual radar environment is used to support the ongoing operation.

1.5.3.4.1 Advantages

This method allows for a minimum amount of impact to the ongoing operation.

1.5.3.4.2 Disadvantages

A very high degree of coordination and flexibility must be incorporated in the test planning because of the requirements of the ongoing operation. The two programs running serially will of necessity require maximum computer usage.

1.5.4 Types of Testing and Test Tools

1.5.4.1 Simulation

Two types of simulation or combinations thereof are available for System Implementation.

1.5.4.1.1 Simulation Tape

The Simulation Sub-program is an effective and efficient tool for providing input to the System for problem analysis. This method provides for submission of a maximum of test data in minimum time. This type of simulation should be used with the Baseline whenever updated or new system tapes are placed in Service.

1.5.4.1.2 Scripting (See attachments 7 & 8)

Scripted input can be utilized in System Integration. Development of scripts should be given the same consideration as the Baseline (simulation tape) in that they must be carefully constructed to assure the exercise of the program functions to be evaluated. An additional consideration is the development of personnel proficiency by exposure to all possible message types and responses.

1.5.4.1.3 Recorded Digitized Radar Data

Data from Common Digitizers (CDs)can be recorded when equipment is provided and used as radar input for multiple tests. This facilitates using moderate or heavy traffic for psuedo live testing during light traffic periods.

Test Team personnel can document flight plans and modifications to those flight plans while digitized information is recorded. Discrete transponder equipped flights can be assigned individual discrete codes. Thus, a flight plan simulation tape and scripted modification inputs can be arranged to "fit" the recorded radar data.

1.5.4.2 Test Tools

1.5.4.2.1 Continuous Data Recording (CDR) Editor

CDR Editor program is available and provides a means for analysis of data recorded during "Real Time" operations.

1.5.4.2.2 Continuous Data Recording (CDR)

CDRs are automatically generated by EARTS programs. Outputs from CDR data are used by the CDR Editor and recording levels must be carefully scrutinized by the FIG to assure adequate recording for proper analysis.

1.6 System Shakedown (SS)

1.6.1 Definition

The System Shakedown portion of testing is the final period of implementation leading to operational use of the system. System Shakedown provides for the use of real-time (live) I/O in the actual ATC task.

1.6.2 Objective

The objective of System Shakedown testing is to bring the system to a state of operational readiness by a process of fine tuning the hardware, software, and personnel subsystems. System Shakedown testing culminates in the completion of the Operational Readiness Demonstration (ORD).

1.6.3 Relationship to System Integration

Logically System Shakedown immediately follows System Integration and should as nearly as possible emulate and immediately precede the conduct of Operations Changeover.

1.6.4 Personnel Proficiency

Procedures for accomplishing System Shakedown allow for the development of the level of proficiency required for Operations Changeover as specified in 1800.47.

1.6.5 Test Method

During System Shakedown Testing, manual verification procedures are required. The type and method of verification are determined by the FIG, in coordination with the facility operations personnel and reflected in the test procedures.

1.6.6 Test Analysis and Documentation

1.6.6.1 Observers

Adequate personnel, knowledgeable in the area being evaluated, must be available during test conduct to allow the thorough recording of pertinent test results.

Observer/Operators Logs (see Attachment 5) will be completed by all test observers and operators in adequate detail to allow the test analysis team to prepare required formal reports and forms and to provide adequate information for problem resolution.

1.6.6.2 Continuous Data Recording and Analysis

CDR Analysis should be provided to substantiate problem description and resolution.

1.6.6.3 Bulk Store File

The Bulk Store File will be updated throughout testing to verify this capability during system operation. Generation of the file requires verification and time must be allocated for this effort. Accurate time requirements for these activities should be a "fall out" benefit of SOST.

1.6.7 Conclusion of System Shakedown

System Shakedown will be concluded by successful completion of an ORD. Test Management at the facility, as well as other responsible parties, (AAF, AAT, or region) must attest that operating procedures, interfacility agreements, and personnel proficiency are adequate to support continued operations and that there are no deficiencies in the system which preclude its use operationally.

2.0 TEST MANAGEMENT

A FIG will be established at each facility in accordance with Agency Order 1800.47 (SPP). This order defines the FIG Organization which is under the technical direction of the Regional Onsite Engineering Representative (OER) and specifies the functions of the organization.

As a part of the FIG Organization it is necessary to establish the positions of Test Director and Test Coordinator as defined below. In addition, the organization of the Test Team for specific tests should as nearly as possible duplicate positions which are planned for operational staffing. Additional positions, such as observers, will be required for testing, which have no operational counterpart. A suggested personnel structure for conduct of System Integration and System Shakedwon testing is described below.

2.1 Test Director

The Test Director is responsible for the overall System Integration and Shakedown effort and provides direction through the Test Coordinator to subordinate members of the test team. He provides liaison between the FIG and Facility Management.

2.2 Test Coordinator

The Test Coordinator is responsible for the overall System Integration and Shakedown conduct. He insures proper structuring of the individual missions and assures that mission objectives are accomplished. He coordinates with the Test Director on unresolved problems and recommends remedial action.

2.3 Test Manager

The Test Manager is responsible for a specific test as assigned. He insures availability of required equipment and personnel prior to commencing the test. During actual testing, he serves as floor manager, verifying adherence to the mission test order. The Test Manager keeps the Test Coordinator apprised of test results and recommends modifications when deemed necessary. The Test Manager insures that all recorded data are collected and forwarded for analysis.

2.4 Test Observers

Test Observers will be assigned to monitor and record activities for specific test areas and provide expertise to the personnel manning test positions (Test Operators). The Test Observer must provide the strict adherence to test procedures during the actual test conduct.

2.5 Test Operators

The Test Operators are the personnel assigned to man the test positions during a particular test mission. They are expected to follow the mission test order and request assistance from a Test Observer when necessary.

2.6 Involvement of Operational Personnel

The conduct of System Integration and Shakedown requires the involvement of a maximum number of operations personnel in all phases of testing at both the center and peripheral facilities. This allows for evaluation of operational procedures and the demonstration of proficiency by involved personnel. Testing must allow for this involvement with no adverse impact on service to the users of the Air Traffic Control System.

2.6.1 Facility Coordination

The FIG must accomplish timely and effective coordination with center and peripheral facilities management to assure that proper and adequate staffing, scripts, support material, test equipment, communications, etc., are available to support the conduct of scheduled tests.

3.0 SPECIFIC INTEGRATION AND SHAKEDOWN PLANS

3.1 General Requirements for all Systems

3.1.1 Operating Procedures

System Shakedown provides for the refinement of local operating procedures to support the system to be implemented. Necessary Inter- & Intra-Facility Procedural agreements must be completed prior to commencement of the System Shakedown Phase.

3.1.2 Personnel Proficiency

Personnel should be sufficiently trained prior to the srart of System Integration so that they may confidently participate in the test effort. Although personnel proficiency and knowledge will undoubtedly be gained during System Integration, it should be a period of "fine tuning" personnel and not an introduction to automation. The training of personnel for operation and maintenance of equipment at the center, as well as at remote sites, is the responsibility of the region.

3.1.2.1 AT Training

Formal training required for Data Systems Specialists and operations personnel will be completed prior to commencement of System Integration.

Sufficient personnel will be proficient in the Operation of required devices and all necessary facets of the operation to allow at least four (4) hours of operation for five (5) days per week prior to commencement of System Shakedown.

Sufficient personnel will be proficient in the operation of the system to support continuous use for planned periods of operation prior to conclusion of System Shakedown.

3.1.2.2 AF Training

Formal training required for those AF personnel necessary for maintenance of the planned system will be completed to the extent possible prior to the start of System Integration.

Sufficient personnel will be provided to operate and maintain the equipment required to support at least four (4) hours of operation five (5) days per week prior to commencement of System Shakedown.

Sufficient personnel will be provided to operate and maintain equipment required to support continuous use of the system for planned periods of operation prior to conclusion of System Shakedown.

3.1.3 Required Reports

3.1.3.1 Individual Tests/Missions

Mission Test Reports should be retained for use in compiling final OD and ORD documentation. Test progress will be reflected in the weekly test reports prepared by the FIG. The local FIG Organization procedures should reflect local, area, and regional requirements.

3.1.3.2 OD Reporting

The completion of System Integration through OD will be formally reported to ATS and AFS through the Regional Director. This report will reflect, at least, test methods employed, hours of testing completed, personnel involvement (local and online facilities), brief description of sotware and hardware system tested, including program modifications for correction of system deficiencies, and recommendations and conclusions of the FIG Organization.

To prevent unnecessary delay in the implementation effort, the Chief and Sector Manager may, at their discretion, provide approval for progression to System Shakedown, pending receipt of the OD or System Integration report.

This action is required on any system for which System Shakedown is planned. No formal reports are required for progression through phases of testing which may be established locally within System Integration and/or System Shakedown.

3.1.3.3 Conclusion of System Integration

Test results obtained after OD to the completion of System Integration will be submitted either as a separate System Integration test report or as a separate section in the final test report for System Shakedwon. The reporting procedures are as specified in 3.1.3.2.

During System Integration, notification will be submitted to AAF-300 approximately 10 days prior to the estimated start date of System Shakedown testing.

3.1.3.4 Conclusion of System Shakedown

Within thirty days following successful completion of an OD, a final test report will be submitted as specified for OD reporting in Paragraph 3.1.3.2.

3.1.4 Communications

Test preparation must include definition of required communications during conduct of test missions. Test procedures should define available and preferred methods of communications.

3.2 Specific Test Plan - EARTS Radar Data Processing (ERDP)

3.2.1 Definition

En Route Automated Radar Tracking System (EARTS)

This program provides the initial automation for the radar controller's position in the EARTS. The program has been developed as the minimum operational package to be implemented when converting to digital radar displays.

The plan view displays (PVD) will be capable of accepting either broadband or digital data, but not simultaneously. The PVDs are convertible; that is, capable of operating in the horizontal or in the vertical position. During System Integration, testing should include the evaluation of operations with the displays in both the horizontal and vertical positions, as well as specific tests to establish the feasability of changing from vertical to horizontal and vice versa during transition tests. System Shakedown may initially utilize the displays in the horizontal position (if operationally feasible); however, by the conclusion of System Shakedown operation in the vertical configuration should be the routine.

3.2.2 Assumptions and Constraints

Preparation of this plan and the associated specifications was based on the following assumptions and constraints. Should any of the assumptions prove invalid, or the constraints be violated, revision of the required testing may be necessary.

3.2.2.1 Assumptions

Required changes in operation/separation standards will be specified in revisions to the Air Traffic Procedures Manual by Air Traffic Service.

3.2.2.2 Constraints

Required radar surveillance testing will be completed, and the performance of the surveillance functions will be verified, prior to the use of radar inputs and tracking in System Shakedown testing.

3.2.3 Areas to be Evaluated

Tests specified for Integration and Shakedown cover functions which are added by implementation of the Radar processing provided by this program; specifically, those functions associated with radar inputs, Radar Controller I/O, and radar tracking.

3.2.3.1 Routine Functions

For individual tests, see Test Specifications.

3.2.3.1.1 Recommended Test Method

Simulation with scripted I/O for FDP and recorded radar input, targets of opportunity, scripting and flight check aircraft for RDP functions.

3.2.3.1.2 Approximate Duration

Up to 3 months (dependent upon availability and number of R controllers). Verification of Surveillance System must be completed prior to OD.

3.2.3.1.3 Suggested Staffing

1 Test Manager
1 Observer per online PVD
1 Systems Engineer(SE)
1 Data Technician
1 Display Technician
1 CD Technician (per participating radar site)
1 Radar Controller per online PVD
1 Technician for Radar Data Recorder (i.e., VR-3700B) if this equipment is to be used.
1 SPS/SDS

3.2.3.1.4 Analysis

Approximately two manhours for each hour of testing.

Statistical Analysis supported by Data Reduction and Analysis (CDR Editor) programs must be performed. Results will be expressed in terms of defined performance measures.

3.2.3.2 Internal Failures

For individual tests, see the Test Specifications.

3.2.3.2.1 Test Method

Overlay with Routine Functions (RF) Testing. Simulation by induced failures and detailed scripting.

3.2.3.2.2 Approximate Duration

Two hours per Radar Keyboard Multiplexor Channel.

3.2.3.2.3 Suggested Staffing

As specified for routine functions with additional Test Managers/Observers, as required.

3.2.3.2.4 Analysis

Majority of analysis should be accomplished during test conduct. Documentation of results will require approximately two manhours.

3.2.3.3 External Failure

For individual tests, see Test Specifications:

3.2.3.3.1 Test Method

Overlay with Routine Functions (RF) Testing; simulation with induced failures and detailed scripting.

3.2.3.3.2 Approximate Duration

One hour per radar site. This time does not include required pre test briefing and/or coordination of remote site personnel activity.

3.2.3.3.3 Suggested Staffing

As specified for Routine Functions (RF) Tests with additional Test Managers/ Observers, as required.

3.2.3.3.4 Analysis

Major analysis during test conduct; allow three manhours for test documentation.

3.2.3.4 Maintenance Procedure Validation

For individual tests, see Test Specifications.

3.2.3.4.1 Recommended Method

Simulation with detailed scripting, using redundant system concurrent with Routine Functions (RF) testing.

3.2.3.4.2 Approximate Duration

CDC - 80 hours
Data Acquisition Group - 24 hours per radar site
SMMC - 40 hours

3.2.3.4.3 Suggested Staffing

1 Test Manager
2 Technicians
1 Data Technician
1 Display Technician
1 ASE/SE (SMMC only)

3.2.3.4.4 Analysis

Two manhours per active test hour.

3.2.3.5 Transition Tests

Full reevaluation of all procedures required for completion of this test series is of paramount importance. Procedures must encompass scheduled and unscheduled termination of radar processing, as well as backup radar display outputs activation.

For individual tests, see the Test Specifications.

3.2.3.5.1 Recommended Method

Scripted Simulation. Schedule as prerequisite to all RF testing.

3.2.3.5.2 Approximate Duration

Approximately one half (½) hour for each transition, in addition to scheduled RF test.

3.2.3.5.3 Suggested Staffing

Same staffing as scheduled Routine Functions Test. Additional personnel should be assigned for refinement of procedures when deemed necessary.

3.2.3.5.4 Analysis

Primary Analysis should be accomplished during test conduct. Scheduling should allow for incorporation of any required procedural changes and briefing of affected personnel.

3.2.3.6 Data Base Maintenance

For individual tests, see the Test Specifications.

3.2.3.6.1 Test Method

Offline with baseline validation. Final validation should be accomplished in conjunction with scheduled RF testing.

3.2.3.6.2 Approximate Duration

Bulk Store File - Two hours
System Tape Generation - Six hours
System Tape Update - Two hours
Baseline validation of the system tape is required on full system, in addition to offline time listed above.

3.2.3.6.3 Suggested Staffing

1 Test Manager
1 Observer
1 Computer Operator

3.2.3.6.4 Analysis

Two to ten hours per test, dependent on changes incorporated.

4.0 TEST PROCEDURES AND MISSION TEST ORDERS

4.1 Procedures

Section III of this document provides the detailed procedures for conduct of System Integration and System Shakedown.

4.1.1 Schedules

The TMO of the facility must prepare the "long range" schedule and configuration/sectorization tables as indicated in the procedures.

The long range schedule should be used for planning of individual test missions and should provide adequate flexibility to allow retesting and problem resolution.

Actual scheduling of equipment and personnel will be accomplished upon receipt of a Mission Test Order (MTO).

4.1.2 Manpower

Test Procedures should provide an estimate of local and remote site AAF and AAT personnel required for completion of each test. Manpower for Integration Testing should be limited to that required for actual test conduct with minimum overlap for proficiency development.

Time required for briefing and debriefing of test participants should be included in estimates of manpower requirements (attachment 4).

4.1.3 Equipment

Hardware requirements, including equipment external to the ARTCC, will be specified for each individual test.

Required equipment validation testing must be specified, and adequate time allowed in equipment schedules.

4.1.4 Procedural Information

Individual test procedures define in detail the step-by-step conduct of each test, and the method of analysis.

When Test Scripts are required, the type and purpose of the script should be specified by the procedures.

Tapes required for conduct of the test, and data tapes generated by the test, which must be saved, should be specified.

Operational and verification procedures required for test conduct must be defined for each test.

4.1.5 Required Documents

Necessary observer/operator logs, and directions for use must be provided (attachment 5).

Directions for handling of logs and "hard copy" ouput must be included for each test (attachment 5).

Individual position logs (message logs, sign on sheets and etc.) required for the test, should be specified.

4.2 Mission Test Orders (Attachments 2 and 3)

A Mission Test Order (MTO) will be prepared by the Test Coordinator for distribution to participating FIG and Test Task Force groups as well as peripheral sites.

4.2.1 Contents

The Mission Test Order (MTO) will specify:

Test/Tests to be conducted
Start and End Time of Scheduled Tests
Assigned Test Manager(s)
Hardware Configuration required
Participating Peripheral Sites
Required Numbers and types of local
  Test Participants
Special Tapes and/or Scripts required

4.2.2 Test Materials

Necessary scripts, procedural information supplemental to information in Test Procedures, Logs, and Check sheets should accompany the Mission Test Order. (See attachments 2 and 3).

4.2.3 Distribution

Mission Test Orders should be distributed as far in advance of the scheduled test date as possible.

Two weeks in advance of scheduled date is the optimum delivery time. However, due to change in scheduled activities required for retesting and/or validation of problem resolution, delivery of MTOs to remote sites may not occur in advance. In cases where it is necessary to reduce the notification time, coordination by telephone/interphone should be accomplished.

5.0 PREPARATION FOR OD DEMONSTRATION AND ORD

5.1 Required Documentation - OD

5.1.1 Joint Acceptance Inspections (JAIs)

Supporting documentation for JAIs or partial JAIs which have been completed on the various subsystems will be available for inspection.

5.1.2 Program Listings

Listings of the software must be available for inspection. This should include listings and descriptions of all modifications in use in the operational software.

5.1.3 Test Reports

Individual Mission Test Reports should be available. A brief resume of hardware, software, and system testing should be provided.

5.1.4 OD Notification

Notification will be submitted to AAF-300 approximately ten days prior to the estimated OD demonstration or declaration.

5.2 Required Documentation - ORD

5.2.1 Joint Acceptance Inspections (JAIs)

All JAIs will be completed, in accordance with Agency Order 6020.2A on the system to be demonstrated and documentation available for inspection.

5.2.2 Program Listings

Listings of the software must be available for inspection. This should include listings and descriptions of all modifications in use in operational software.

5.2.3 Personnel Proficiency

Personnel proficiency must be attested to by responsible organizations, including AAT and AAF, for both local and peripheral sites.

5.2.4 Test Reports

Individual Mission Test Reports will be available. A brief resume of hardware, software, and system testing should be provided.

5.2.5 Operating Procedures

Procedural information required for Air Traffic Control with the automated system must be provided. This includes validated and approved maintenance criteria and procedures for the configuration being implemented.

5.2.6 ORD Notification

Notification will be submitted to AAF-300 approximately ten days prior to the planned Operations Readiness Demonstration (ORD).

5.3 OD Demonstration Conduct

5.3.1 Demonstration

An Operational Demonstration will be arranged to allow observation by all interested Services of all aspects of the operation in a pseudo environment which duplicates the full system operation. The demonstration must, as a minimum, include the Start-Up, operation with all applicable I/O subsystems, failures and recovery capabilities, concurrent EARTS/System Support (SS) operations, concurrent EARTS/AF operations, and shutdown. An extended duration is not required, but system loading should be designed to provide heavy traffic conditions.

5.3.2 Completion of OD

Operational Demonstration of the system will be attested to by cognizant representatives AT and AF Washington, Region and Facility management.

5.4 ORD Conduct

5.4.1 Demonstration

The actual ORD should be scheduled to allow observation by interested parties of all facets of the planned operation, including STARTUP and planned SHUTDOWN of the system. Concurrent operations of the redundant system for SS and maintenance processing must be demonstrated where redundant systems are available. Inducement of failures for demonstration of recovery procedures should not be planned.

5.4.2 Conclusion of ORD

Upon satisfactory completion of the ORD, representatives of the various offices and branches will complete the system JAI, certifying the system as satisfactory for use in support of the ATC operation.

6.0 OPERATIONS CHANGEOVER

6.1 Purpose

Operations Changeover provides a period for phasing the automated system into operational use. Depending upon the duration and thoroughness of the System Shakedown effort, Operations Changeover may be complete at the conclusion of the ORD.

SECTION II

TEST SPECIFICATIONS

1.0 PURPOSE

The Test Specifications define the areas to be evaluated during System Integration and Shakedown and list the tests required for implementation. The actual procedures to be followed in order to accomplish System Integration/Shakedown goals are defined in the test procedures (Section III). The test specifications list the individual tests and what the test is designed to evaluate.

2.0 OBJECTIVES

The objective of the Test Specifications is to identify and specify all System Integration and Shakedown testing required to bring a system to a state of operational readiness, and to ensure that none of the many facets have been overlooked.

3.0 TEST CONDUCT AND SCHEDULING

A brief resume of the types of tests to be conducted is listed below. The "Overlay," "Supplemental" and "Retest" tests will be used, as required, to accomplish the overall goals of the System Integration and Shakedown test effort.

3.1 Primary Tests

Primary Tests will be scheduled to evaluate the Routine Functions (RF) of the Operational Program and Surveillance System performance. Typical Routine Functions are Bulk Flight Data Processing, Console Data Terminal Utilization, Radar Processing and PVD Utilization, External Interface, Supervisory Inputs and Outputs, and System Interactions.

Surveillance System testing "onsite" will be the responsibility of the FIG and will be conducted during System Integration and Shakedown.

Surveillance System Testing, while stated to be conducted during System Integration, may be started as early as hardware/software will permit, but in all cases will be completed before ORD is reached.

3.2 Overlay Testing

Overlay tests may be run concurrently with the primary tests. They will include all types of testing that can be performed in conjunction with the primary test without derogating the primary test objectives. Overlay tests include transition procedures (START/STOP, etc.) and internal and external failures.

Procedures for overlay tests should be defined to allow their use as an independent test, as well as for use in recovery of the System or device during a primary test.

3.3 Supplemental Tests

Supplemental tests are similar to overlay tests in that some portions may be run simultaneously with the primary tests; however, the simultaneous portion will be run "offline."

Supplemental tests are limited to assembly of adaptation data and its uses in building system discs, creation and update of bulk store files, baseline, and simulation tapes.

These tests require the validation of newly created tapes and files, through application of routine functions testing, by baseline application or scheduled primary test missions.

3.4 Maintenance Tests

Corrective maintenance must be evaluated as an integral part of scheduled primary tests. In addition, specific tests must be defined for evaluation of the preventive maintenance activities and the accomplishment of required engineering changes.

3.5 Surveillance System Testing

Surveillance System Testing (SST) consists of a series of tests designed for validation of radar site location, alignment, collimation, adaptation and system performance. This series of tests legitimately falls into the primary, supplemental, and maintenance tests categories.

The total SST test series is seen to be a continuing requirement for integration and certification of "New," relocated or modified radar sites and, therefore, is incorporated as a part of SI and SS testing.

3.5.1 RADAR Site Location and Alignment (SST Subtests 1 through 4)

These tests legitimately fall into the Hardware Integration test area and are included in the Test Procedures under Maintenance Procedure Tests.

MP-65.1 Radar Site Location (covers SST Subtest #1).

MP-65.2 Target Position Accuracy (SST Subtest #2).

MP-65.3 Beacon Data Base (SST Subtest #3).

MP-65.4 Collimation and Channel Alignment (SST Subtest #4).

This testing must be completed once for each radar site to be interfaced with the facility.

Detailed specifications and procedures for conduct of this testing will be supplied in separate documents.

The TMO, ARTCC and AF Sector must coordinate support for testing of sites.

3.5.2 RADAR Adaptation Validation (SST Subtests 5 though 7).

These tests are included as a part of Data Base (DB), supplemental testing, and are included in the test procedures, Section III, as the DB-63 series, as follows:

DB-63.1 Weather and Fixed Mapping Unit (WFMU) Masking. (SST Subtest #5).

DB-63.2 RADAR Data Count (SST Subtest #6).

DB-63.3 Registration Data Accuracy (SST Subtest #7).

Required NAFEC Support must be coordinated well in advance of scheduled test analysis.

3.5.3 Surveillance System Performance

These tests are treated as primary tests and can be completed as a part of required RF testing.

The three tests required are included in the procedures (Section III) as follows:

RF 64.4a Track Loss (SST Subtest 8).

RF 64.4b Track Swap (SST Subtest 9).

RF 64.4c Track Deviation (SST Subtest 10).

This testing will be conducted using the SINE SST Specifications and Procedures. The facility FIG is responsible for completion of the required testing.

4.0 TEST TYPES AND SERIES

4.1 Types of Test

Tests will be designated by type within the predefined groups. Test Grouping and type designation are as follows:

GROUP	TYPE	DESIGNATOR
Primary	Routine Functions	RF
Overlay	Transition/Recovery Procedures	TR
	Internal Failure	IF
	External Failure	EF
Maintenance	Maintenance Procedure Validation	MP
Supplemental	Data Base Maintenance	DB

4.2 Application of Test Series

Functions and capabilities of the system must be thoroughly analyzed, and deviations from specified testing defined in the System Integration and Shakedown Procedures, prepared by the FIG.

4.2.1 Example of Test Number Interpetation

RF-1 Indicates the first Routine Functions Test for System Integration.

TR-1 Indicates the first Transition Procedure testing (START) for System Integration.

5.0 AREAS OF EVALUATION

The individual tests are designed to evaluate specific hardware and software functions, interactions during System Integration, and personnel proficiency and operational procedures during System Shakedown.

To avoid redundancy, areas of evaluation are defined below. Each specified test will list, by a capital letter, the areas of primary evaluation.

Many tests provide data for evaluation of functions in addition to those for which the test is designed. The data should be considered when evaluating specific hardware and/or software functions that pertain to the data.

Example: RF - 1 Bulk flight data processing

Test Name

Test Series Number

Test Type

Areas of Evaluation: A
(See paragraph 5.1.1)

Primary Evaluation

The upper case (capital) "A" indicates that the test must be designed to evaluate the Flight Plan Processing functions of the program which are defined under A (Evaluation Area Designator) in paragraph 5.1.

5.1 Evaluation Areas and Designators

5.1.1 System Integration

A Bulk Flight Data Processing

All system functions involved in the input, processing, and subsequent distribution and adequacy for use, in support of the actual ATC task, must be evaluated.

1. Input Acceptance and Route Validation

   Bulk flight data acceptance and error responses.

2. PVD Format

   All computer generated PVD data conform to prescribed format.

B Console Data terminal (CDT)

Verify that acceptance or rejection, processing, and output of appropriate response messages are accomplished in accordance with the Computer Program Functional Specifications (CPFS) and operational requirements for all CDTs located within the ARTCC. Evaluation must include all messages legal for input by CDTs. Input must be designed to provide for generation of all possible error responses.

C Supervisory I/O

Proper processing and responses to all supervisory messages listed in applicable CPFSs.

Evaluation must include the attempt to enter messages from other than a legal device.

D Interfacility Interface

All functions of the EARTS interfacility interface must be evaluated (NAS, ARTS II, ARTS III, etc.).

1. Ability of the EARTS program to:

    a. Provide proper output to the appropriate facility for Radar Position Data.

    b. Proper rejection of erroneous data inputs from the interface.

    c. Proper acceptance, processing and, displays of valid input from the appropriate facility.

E BANS Interface (at San Juan)

Proper acceptance, processing, and generation of output responses to BANS system.

Proper error response, including error messages to appropriate devices as a result of unacceptable inputs.

F System Interactions

This area of evaluation is applied to all tests and requires the investigation of how each individual device and subsystem operation relates to total system operations. Testing should include studies of any possible adverse interactions or interference that may occur in the system. Evaluation areas should include:

Man/machine interfaces
Environmental
Communications
Coordination Requirements (Operational)
Procedural definitions
Personnel and Training
Main/Standby power and grounding
And etc.

G Maintenance Procedures

Evaluation of procedures to isolate and repair equipment faults, perform preventive maintenance, and complete engineering changes on a timely basis. These tests should be performed on the offline system to insure that these operations do not interact with ongoing operations.

Evaluation of the effect on the system when the various maintenance programs are operated on the redundant system.

H Routine Procedures

Evaluation of the procedures used by facility personnel to operate and maintain the online system. These procedures are required to support the system within the normal operating environment, exclusive of failures or transitions.

I Recovery Procedures

Evaluation of the procedures to be used by facility personnel to maintain operations during failure conditions. Failures may be caused by system elements at the ARTCC or by remote I/O equipment (single and multiple devices subsystems), as well as interface components. The ability of personnel and software to recognize and correct or replace malfunctioning equipment must be evaluated.

J Transition Procedures

Evaluation of the methods for transition from manual-to-automated and automated-to-manual or between intermediate levels of automated operation. Evaluation should include procedures for verifying that the hardware, software, and personnel subsystems will successfully operate at the new operational level. This testing must evaluate adequacy of methods for recovery of all data during scheduled and unscheduled initiation and terminal of Radar Data Processing, and for recovery of sufficient data to determine the cause of unscheduled transitions.

K Data Base Maintenance

1. Evaluation of programs and methods for proper preparation of adaptation data, and operation of the necessary support programs for generation and update of operational EARTS system tapes/discs.

2. Evaluation of the adequacy of support programs and procedures for generation and maintenance of Bulk Store File tapes for operation with the EARTS operational program.

3. Adequacy of baseline simulation tapes for verification of program functions prior to placing a newly generated or updated system into service. The evaluation includes ability of personnel to recognize the need for and define additions or modifications to data inputs due to changes in adaptation or program functions, and the effectiveness of simulation tapes for verification of system tapes.

L EARTS Operational Support System (EOSS)

Evaluation of the ability to operate the various EOSS processors on the redundant system with no interference to the Operational System.

M Radar Controller Inputs and PVD Outputs

Verify that proper acceptance, processing, and response generation are accomplished in accordance with applicable CPFs. Determine the effect on the system of erroneous input data and appropriate computer response.

Ascertain the accuracy and adequacy of display outputs.

N Surveillance System Adaptation

Establish, through quantitative measurements, the configuration of radar adaptation to provide for optimum radar coverage. Verify that radar/CD site adaptation is accurate and establish settings of related system adaptation parameters to provide for optimum tracking performance.

Q Tracking

Establish the performance of the tracking function through measurements of primary system performance indicators. Assess the technical acceptability of tracking performance, and, if deficient, determine the adjustments to system parameters that are necessary to achieve optimum performance.

R System Monitoring

Verify that effective monitoring of the system operation is accomplished by one of the following three methods, or combinations thereof:

1. Hardware (local and remote equipment status indicators, alarms, etc.).

2. Software.

3. Personnel (local and remote site personnel operating and monitoring equipment procedurally to identify system faults).

5.1.2 System Shakedown

All areas listed in paragraph 5.1.1 (System Integration) must be reevaluated in the true operational environment. In addition, the following areas of evaluation should receive primary emphasis during shakedown testing:

O. Operating Procedures

Evaluation of the adequacy of operating procedures and interfacility agreements for conduct of the actual Air Traffic Control (ATC) task in the automated environment. START/STOP and recovery procedures should receive thorough evaluation and refinement.

P. Personnel Proficiency

The ability of personnel to operate and maintain the system, as well as the ability of control room personnel, to operate the I/O equipment for communication with the computer.

S. System Capacity

Verify the adequacy of the system for support of the actual ATC task under all traffic conditions. No attempt should be made to intentionally overload the system. The capability of the system to provide accurate and timely responses under all conditions must be established.

6.0 REQUIRED TESTS

Tests defined in this section are designed to provide the most effective division of functions for ease of evaluation. Dependent upon availability and proficiency of personnel, many of the individual tests specified in a series may be combined into a single mission.

Tests are further defined as applicable to Integration or Shakedown. Again, dependent upon the resources available for test conduct and analysis, facilities may desire to continue Integration testing in the "real time" live environment. Integration tests are designed for application beyond IOC through use of procedurally limited I/O test methods.

6.0.1 Primary Tests - System Integration

RF-60 Routine Functions

Areas of Evaluation: F, H, L, O, P, S

RF-61 PVD System

Areas of Evaluation: F, M, O

RF-62 I/O Messages

Areas of Evaluation: A, B, D, E, M, W, X

RF-63 PVD Output

Areas of Evaluation: M

RF-64 Radar Processing

Areas of Evaluation: L, M, S

RF-65 Console Data Terminal (CDT)

Areas of Evaluation: A, C, E, F, R

RF-66 BANS System

Areas of Evaluation: E, F, H, I, M, P, Q, R

6.0.2 Overlay Tests - System Integration

TR-60 Transition Procedures

Areas of Evaluation: C, F, O, P, R

TR-61 START

Areas of Evaluation: C, D, J

TR-62 STOP

Areas of Evaluation: C, D, J

TR-63 FLOP

Areas of Evaluation: C, D, I, M

TR-64 SORE

Areas of Evaluation: C, D, I, M

IF-60 Internal Failures - Single/Multiple

Areas of Evaluation: C, F, J, O, P, R

IF-61 DPS Element failures - Single/Multiple

Areas of Evaluation: G, H, I

IF-62 PVD Failure - Single/Multiple

Areas of Evaluation: G, H, I

IF-63 PVD CED Failure

Areas of Evaluation: G, H

IF-64 CDT Failure - Single/Multiple

Areas of Evaluation: G, H, I

IF-65 Main Power Failure

Areas of Evaluation: G, H, I, O, P

EF-60 External Failure

Areas of Evaluation: B, C, F, G, H, I, J, R

EF-61 CD/WFMU Failures

Areas of Evaluation: G, H

EF-62 Interface Failures (NAS/ARTS)

Areas of Evaluation: G, H

6.0.3 Supplemental Tests - System Integration

DB-60 Adapted Parameters

Areas of Evaluation: K, L

DB-61 Adaptation Generation

Areas of Evaluation: K, L

DB-62 Device Adaptation

Areas of Evaluation: K, L

DB-63 Radar Data

Areas of Evaluation: K, L

DB-64 Baseline Maintenance

Areas of Evaluation: D, K, L

DB-65 Bulk Store

Areas of Evaluation: A, K, L

6.0.4 Maintenance Tests - System Integration

MP-60 Maintenance Procedures

Areas of Evaluation: B, C, G

MP-61 Preventive Maintenance

Areas of Evaluation: G, H

MP-62 Engineering change

Areas of Evaluation: G, H

MP-63 System Certification (Daily)

Areas of Evaluation: C, G, H, O, R

MP-64 System Certification (Periodic)

Areas of Evaluation: C, G, H, O, R

MP-65 Radar Alignment

Areas of Evaluation: B, C, G, N, S

6.0.5 OD Demonstration

IOC-60 OD Demonstration

Areas of Evaluation - Add: A through S

6.0.6 System Shakedown Testing

RF-70 START/STOP/FLOP/SORE

Areas of Evaluation: A through S

RF-71 System Operations - Light Traffic

RF-72 System Operations - Moderate Traffic

RF-73 System Operations - Heavy Traffic

Duration: 4 to 8 hours per test.

Areas of Evaluation: D, P, S

RF-74 System Operations - Reliability

Duration: 8 to 16 hours

Areas of Evaluation: O, P, S

7.0 DATA COLLECTION AND ANALYSIS

All data pertaining to a particular test will be collected and thoroughly analyzed. This includes output resulting from the test activity as well as logs and reports. All test material will be turned over to the Test Manager for dissemination.

7.1 Data Collection

All test-generated output and reports/logs, CDR Tapes, etc., regardless of their apparent significance, will be collected after each test and forwarded to the Test Manager.

7.2 Data Reduction and Analysis

The Data Reduction and Analysis (DR&A) Team will analyze all test-generated output.

The RF&A team will verify that each test has sufficiently evaluated the areas outlined for that test. If the test results indicate discrepancies, the DR&A team will attempt to identify the system problem. The Data Reduction and Analysis team leader will keep the Test Director, or his representative, apprised of the team's findings, including discrepancies and recommendations.

8.0 DETERMINATION OF COMPLETION

8.1 Completion of System Integration

The Test Management will determine when all required tests have been satisfactorily completed. When the Test Management is satisfied with the system performance and that sufficient personnel are proficient in the operation of all facets to support System Shakedown, Operating Capability will be declared or demonstrated as required.

8.2 Completion of System Shakedown

The Test Management will determine when all required tests have been satisfactorily completed. When the Test Management is satisfied with the system performance and the proficiency of the operational personnel, the Operational Readiness Demonstration will be scheduled.

9.0 TEST SCHEDULING AND STAFFING

Since proper staffing is of paramount importance, all tests will be scheduled as far in advance as possible. Timely coordination with facilities involved is a must to insure proper staffing. Proposed Integration and Shakedown schedules should be included in the locally produced test procedures.

9.1 Tests and Missions

Individual missions should be designed to make maximum use of overlay tests, and combination of required primary tests. Primary tests should be combined wherever possible within the same mission.

9.2 Personnel Proficiency

The Test Management Organization and Facility Staff must be satisfied with the demonstrated proficiency of personnel, both at the ARTCC and remote sites. Therefore, it is imperative that facility personnel participate as fully as possible in System Integration and Shakedown.

SECTION III

TEST PROCEDURES

1.0 GENERAL

1.1 Purpose

These Test Procedures provide detailed guidance to the facility integration group for preparation, conduct and analysis of the required tests, as listed in Section II, for the implementation of the EARTS.

1.2 Objective

The objective of these procedures is to assure standard implementation of EARTS.

1.3 Scope

These procedures define in detail the tests to be conducted by each ARTCC including suggested approach, methods, and test team organization. Individual sites are expected to prepare mission test orders (MTO), test scripts, simulation tapes, recorded radar inputs, and schedules to accomplish the required testing.

1.4 Test Overview

1.4.1 System Integration

These procedures are based upon testing of the radar data processing (RDP) functions of the EARTS operational program.

System integration will utilize simulated, scripted, recorded radar and bulk flight plan traffic inputs, as required, to duplicate the actual traffic conditions of the ARTCC for validation of the data processing and display functions of the system, as well as development of controller, technician, and operator proficiency.

Testing must be conducted in the control, maintenance, and computer operation areas of the facility, and, therefore, must be carefully designed to cause minimum interference with the "On-going" Air Traffic Control Task.

1.4.1.1 Required Tests

All tests as listed in the test specifications, Section II, pages 2-10 through 2-14, paragraph 6.0, must be completed by each site.

Detailed procedures for each type (RF, TR, EF, IF, and DB) of required test are included in paragraph 5 of this section.

1.4.1.2 Test Approach

The basic tests will be defined as required by the specifications; the specific purpose, staffing, and analysis requirements will be shown as sub-tests under the basic tests.

During early phases of SI testing, RF and SS tests will be employed using predominantly simulated and recorded radar inputs in a pure simulation environment. Testing will progress to allow more and more scripted (live online) inputs by test operators until, in the final stages of SI Test, inputs will be predominantly scripted or "free inputs", with on-line radar employing a parallel method (see para. 1.4.1.3) with live traffic being controlled on the operational system, and the controller on the EARTS display duplicating all control/input actions.

This approach allows an orderly and effective transition from SOST type testing to System Shakedown Testing. All that remains for System Shakedown is the reversal of the Test Operator and operational controllers roles; i.e., traffic will be controlled by the EARTS sector, with the current system utilized for verification (see System Shakedown).

1.4.1.3 Test Methods

The following defines the various methods which may be employed in the completion of System Integration testing. While several methods are defined, the method to be utilized by a particular site must be selected by the site; and may be a combination of the suggested methods. The various methods are listed below. Where more detailed discussions of a particular method is felt necessary, the discussion will be contained in an attachment.

1.4.1.3.1 Phased Testing

Testing may be accomplished in test phases which gradually increase the complexity of the processing through controlled inputs and outputs by: Area, Altitude, Radar Site, Program Functions, Beacon or primary targets.

1.4.1.3.2 Sequential

This method employs the total software functional capability, but provides for the conduct of the same test with the various I/O Subsystems (Radar, Display, etc.) enabled singularly.

This method may be particularly beneficial for isolation of suspected or identified problems.

1.4.1.3.3 Centralized

Much like phased, in that output is limited to a few sectors, as opposed to phased all functions. Subsystems and the total center area would be utilized with output confined to a few sectors. This method would, for example, use a Mid-Watch or special Test Sectorization and be particularly useful in conjunction with the parallel test method.

1.4.1.3.4 Parallel

This method would provide for the same air space to be displayed on "side-by-side" displays, one on the operational system and the other with the EARTS digital (Narrowband) display for the same area. (See System Shakedown, paragraph 6.0).

1.4.1.3.5 Procedurally Limited I/O

Much like phased, in that outputs are controlled through limitation of allowable input. This method might prove valuable for isolation of suspected or identified problems. This method can be accomplished through limitation of simulated and scripted inputs and it provides for the gradual increase in on-line inputs through reduction in simulated data and increased scripted data.

In this regard, the same basic test could provide a very beneficial training tool.

1.4.2 System Shakedown

As in SI, the procedures for System Shakedown are based on the testing of the functions of the EARTS operational program.

1.4.2.1 Required Tests

All tests as listed in the test specifications, Section II, pages 2-9 and 2-10, paragraph 5.1.2 must be completed by each site.

System Shakedown procedures are detailed in paragraph 6.0 of this section.

1.4.2.2 Test Approach

The approach upon which these procedures are based, employ the SI/SS role reversal concept as described in paragraph 1.4.1. In addition, the approach requires the use of the parallel test method which is detailed in paragraph 1.4.1.3.4.

1.4.2.3 Test Methods

Generally the test methods available for System Shakedown are an extension to those defined for SI testing in para. 1.4.1.3 with the basic difference being use of "Realtime on-line, live I/O."

System Shakedown requires the validation of automated outputs which is detailed in paragraph 6.0.

1.5 Organization and Use of Procedures

The following paragraphs define the test procedures for completion of all required System Integration (SI) and System Shakedown (SS) testing.

The individual site must amend the procedures to best fit their particular geography, operation and traffic. In some cases, minor modifications may be required in the actual procedures for test conduct which are detailed in para. 5.0 for SI and para. 6.0 for SS. These modifications should only be necessary where the site cannot accommodate the test method selected in the basic test.

1.5.1 Data applicable to all Tests

The procedures for each test must contain detailed information on staffing, required hardware and I/O Configuration, software, and communications channels to be utilized during test conduct. This information, while required for preparation of Mission Test Orders, would be repetitive and lengthly if included in total for each test. Paragraphs 2.0, 3.0, and 4.0 provide detailed information which is to be utilized in conjunction with the procedures contained in paragraphs 5.0 and 6.0.

1.5.1.1 Site Application

Individual sites should take the following action:

1. Study the procedures and determine:
   a. Test approach and methods to be employed.
   b. Develop schedule for testing.
   c. Assign Test Coordinators & SI/SS Test Team to prepare required: Scripts, SIM Tapes and Recorded Radar inputs for testing.
   d. Assemble Test Managers packages for initial SI testing.

1.5.1.1.1 Test Managers Package (TMP)

A TMP should be prepared for each test mission. The TMP should contain at least the following:

1. Copy of Mission test Order (MTO)
2. Hardware Configuration & Schedules
3. List of personnel available to the test Team by specialty
4. List of Required tapes/Disc
   a. System ID & date
   b. Simulation/Radar Tapes
   c. Bulk/Mission files
5. Scripts
6. Observer/Operator Logs
7. Mission Report Form
8. Pre/Post Test Briefing/Debriefing Guides
9. Any special instructions/information required for conduct of this mission (i.e., overlay tests, specific problems to be examined, etc.)

2.0 HARDWARE AND I/O

2.1 Configuration

The computer system configuration must be identified for each test.

2.2 I/O

I/O devices required, both local and remote, must be defined

Sector plans must be developed and identified for early test. Some test may use all sectors, other may only require a few.

2.3 Communication

System Integration and System Shakedown testing requires an operational environment. All available communications will be utilized. Communication requirements for each test must be defined.

During testing, the designed control communications lines will be used; should the line be required for actual control information, the test operator should yield immediately.

3.0 SOFTWARE AND ADAPTATION

3.1 Software

Testing is designed to evaluate the functional and operational capabilities of both the Operational and Functional program.

The latest source tape available will be utilized for testing. Therefore, test mission scheduling will be constructed to allow the "bringup" of update tapes which are anticipated to be delivered during the particular test phase. Specific data base (DB) tests are defined, which provide for the building and baselining of system tapes. These tests will be scheduled and used, as required, for the "phasing-in" of newly delivered Operational and Functional Systems.

3.2 Adaptation

Adaptation will also be maintained as nearly as possible to coincide with operational needs. This approach requires that the data base be reassembled to correct identified problems. For certain tests, it may be desirable to "freeze" adaptation until functional capabilities of the program are validated; therefore, some testing may of necessity be accomplished with other than the most current adaptation.

Data Base (DB) tests are defined which provide for the updating of adaptation data; missions should be planned to conduct these tests, as the site anticipates updates may be required. Adaptation allows definition of sectorization plans. Where possible sites should define some plans specifically for test purposes, i.e., for sectorization plans to accommodate Parallel Testing.

3.3 Support Software

All EOSS, Utility, Maintenance, and Diagnostic Software which is required for system operation and maintenance will be exercised in the normal course of test preparation, conduct, and analysis.

Descriptions encountered during the use of the support software should be noted and appropriate PTR/PCP action must be taken in accordance with agency orders.

3.3.1 Bulk Store Flight Plans

SI Testing should be planned to include use of Bulk Store Flight Plan outputs. This will require the use of appropriate support software for preparation of the required files/tapes.

3.3.2 SIM

Simulation tapes may be prepared for use with recorded RADAR data. Support software is available for conversion of recorded RADAR data which can be used in preparation of required scripts.

3.3.3 Recorded Radar Data

Digital Data Recorders (ie., VR-3700B) will be provided for use in RADAR testing. This will allow the recording of heavy traffic periods and the playback of the data during non-operational hours for testing.

Information on software and use of recorded RADAR data is contained in the SINE SST Test documents. (Specifications SINE 330-1; Procedures SINE 430-1).

3.3.4 DR&A

Detailed analysis of the test outputs will be required throughout testing. This analysis requires the use of the various CDR Editor Programs and options.

Problems or discrepancies encountered in the use of these programs should be documented and appropriate PTR/PCP action initiated.

4.0 PERSONNEL

The staffing required for conduct of each test will be indicated in the individual test procedures.

4.1 Site Application

Upon receipt of the Test Managers' Package, the Test Manager prepares the Pre-Test Briefing and assigns Test Team personnel to specific positions.

Prior to the commencement of the test mission, scripts, logs and report forms will be distributed to the appropriate Test Team operators and observers.

A list of tapes required, etc., will be supplied to the computer operator with instructions as to what and how data (CDR etc.,) tapes are to be retained for later analysis.

In addition, the Test Manager will: assure that equipment checkout is completed, give the pre-test briefing (assure remote sites are briefed as required), advise operations (Assistant Chief) of test start time, assure that all test personnel are in their assigned positions, and provide guidance to test personnel as required throughout the test. The Test Manager is responsible for debriefing of test participants (including remote sites), assuring that required output (tapes and hard copy) is collected, marked, and filed. He (Test Manager) orders RD&A as required, requests detailed analysis of discrepancies, and submits the Mission Test Report (may be delayed until remote site data are received to the Test Coordinator with recommendation for conclusion or retesting.

4.2 Duties of Test Team

Duties of the Test Operators and Observers are detailed in Section I of this document, and are performed as directed by the Test Manager for the individual test mission and as required by the appropriate test scripts.

5.0 TEST PROCEDURES

5.1 Routine Function (RF) Tests

All RF Tests will be conducted with the EARTS system in an operational configuration. Test duration during SI should be a maximum of four hours and tests should be repeated as required. Test Method and Resource requirements for each test are to be defined (TBD) by the Facility Integration Group (FIG).

5.1.1 RF-60 Routine Functions

5.1.1.1 RF-60.1 Test Bed Stabilization

5.1.1.1.1 Purpose

Familiarize Test Team with test procedures and system operation. Verify the adequacy of procedures, data, and staffing for conduct of further testing.

5.1.1.1.2 Areas of Evaluation: H, R

5.1.1.1.3 Test Method - (TBD by FIG).

5.1.1.1.4 Resources - (TBD by FIG).

5.1.1.1.5 Analysis - On-the-spot evaluation of personnel proficiency.

5.1.1.2 RF-60.2 Proficiency Development

5.1.1.2.1 Purpose

Familiarize test operators (operations personnel) with system operation and use of I/O messages.

5.1.1.2.2 Areas of Evaluation: M, P

5.1.1.2.3 Test Method - (TBD by FIG).

5.1.1.2.4 Resources - (TBD by FIG).

5.1.1.2.5 Analysis - On-the-spot evaluation of personnel proficiency.

5.1.1.3 RF-60.3 System Validation

5.1.1.3.1 Purpose

Validate the adequacy of the EARTS system to support the ATC task.

5.1.1.3.2 Areas of Evaluation: F, H, O, R, S.

5.1.1.3.3 Test Method - (TBD by FIG).

5.1.1.3.4 Resources - (TBD by FIG).

5.1.1.3.5 Analysis - Detailed analysis of the system operation.

5.1.2 RF-61 PVD System

5.1.2.1 Purpose

Familiarize operational personnel with the PVD system. Areas to be validated include the operation of the various control panels, trackball, and computer entry device (CED).

5.1.2.2 Areas of Evaluation: F, M, O.

5.1.2.3 Test Method - (TBD by FIG).

5.1.2.4 Resources - (TBD by FIG).

5.1.2.5 Analysis - Detailed analysis of the system operation.

5.1.3 RF-62 I/O Messages

5.1.3.1 Purpose

Familiarize operational personnel with I/O message functions. Validate the I/O messages for ATC purposes.

5.1.3.2 Areas of Evaluation: A, B, D, E, M.

5.1.3.3 Test Method - (TBD by FIG).

5.1.3.4 Resources - (TBD by FIG).

5.1.3.5 Analysis - On the spot evaluation of personnel proficiency and a detailed analysis of the adequacy of I/O messages for ATC purposes.

5.1.4 RF-63 PVD Outputs

5.1.4.1 RF-63.1 Data Symbology

5.1.4.1.1 Purpose

Validate the adequacy of the display symbology for targets, PVD lists, data blocks, etc., for ATC purposes.

5.1.4.1.2 Areas of Evaluation: A, D, N, Q.

5.1.4.1.3 Test Method - (TBD by FIG).

5.1.4.1.4 Resources - (TBD by FIG).

5.1.4.1.5 Analysis - Detailed analysis of the system operation.

5.1.4.2 RF-63.2 Map Data

5.1.4.2.1 Purpose

Validate the adequacy and accuracy of map data.

5.1.4.2.2 Areas of Evaluation: M.

5.1.4.2.3 Test Method - (TBD by FIG).

5.1.4.2.4 Resources - (TBD by FIG).

5.1.4.2.5 Analysis - Detailed analysis of the map data.

5.1.4.3 RF-63.3 WFMU

5.1.4.3.1 Purpose

Validate the adequacy of the WFMU data for ATC purposes.

5.1.4.3.2 Areas of Evaluation: M.

5.1.4.3.3 Test Method - (TBD by FIG).

5.1.4.3.4 Resources - (TBD by FIG).

5.1.4.3.5 Analysis - On the spot analysis of WFMU displayed data.

5.1.5 RF-64 Radar Processing

5.1.5.1 RF-64.1 Tracking

5.1.5.1.1 Purpose

Familiarize operational personnel with the tracking functions of the EARTS system. Validate the adequacy for ATC purposes.

5.1.5.1.2 Areas of Evaluation: N, Q.

5.1.5.1.3 Test Method - (TBD by FIG).

5.1.5.1.4 Resources - (TBD by FIG).

5.1.5.1.5 Analysis - On the spot evaluation of the displayed information.

5.1.5.2 RF-64.2 Acquisition

5.1.5.2.1 Purpose

Familiarize operational personnel with the target acquisition functions. Validate the adequacy for ATC purposes.

5.1.5.2.2 Areas of Evaluation: A, N, Q.

5.1.5.2.3 Test Method - (TBD by FIG).

5.1.5.2.4 Resources - (TBD by FIG).

5.1.5.2.5 Analysis - On the spot evaluation of the displayed information.

5.1.5.3 RF-64.3 Handoff

5.1.5.3.1 Purpose

Familiarize operational personnel with inter/intra facility handoff functions and validate the adequacy for ATC purposes.

5.1.5.3.2 Areas of Evaluation: D, N, Q.

5.1.5.3.3 Test Method - (TBD by FIG).

5.1.5.3.4 Resources - (TBD by FIG).

5.1.5.3.5 Analysis - On the spot evaluation of the displayed information.

5.1.5.4 RF-64.4 Track Loss

(AAF to Define)

5.1.5.5 RF-64.5 Track Swap

(AAF to Define)

5.1.5.6 RF-64.6 Track Deviation

(AAF to Define)

5.1.6 RF-65 Console Data Terminal (CDT)

5.1.6.1 Purpose

Familiarize operations personnel with the legal/ illegal actions associated with the CDT. Validate the adequacy of the CDT for ATC purposes.

5.1.6.2 Areas of Evaluation: A, C, E, F, R.

5.1.6.3 Test Method - (TBD by FIG).

5.1.6.4 Resources - (TBD by FIG).

5.1.6.5 Analysis - On the spot analysis of the CDT system.

5.1.7 RF-66 BANS System

5.1.7.1 Purpose

Familiarize operations personnel with operation and functions of the BANS system. Validate the adequacy for ATC purposes.

5.1.7.2 Areas of Evaluation: E, F, H, I, M, P, Q, R, S.

5.1.7.3 Test Method - (TBD by FIG).

5.1.7.4 Resources - (TBD by FIG).

5.1.7.5 Analysis - Detailed analysis of the BANS/EARTS operation.

5.2 TR-60 Transition Procedures

The following procedures should be validated through use during testing and modified as required for support of testing and operational use of the system. Some aspects of transitioning from manual to automated RDP, and from automated to lesser degrees of processing and to manual operations may require specific tests to validate these procedures or modifications thereto. In this regard, tests of the following procedures may be scheduled as "stand alone test missions," or "overlayed" with planned RF tests.

5.2.1 TR-61 START (Scheduled Transition and Acquisition of Relevent Traffic)

5.2.1.1 Purpose

To validate the procedures and methods for transition from a manual mode of operation to an automated Radar Data Processing mode.

5.2.1.2 Areas of Evaluation: C, D, J.

5.2.1.3 Test Method - (TBD by FIG).

5.2.1.4 Resources - (TBD by FIG).

5.2.1.5 Analysis - On the spot evaluation of ability to assume automated operation, with no loss of data.

5.2.2 TR-62 STOP

(Scheduled Termination of Operational Program)

5.2.2.1 Purpose

To validate the procedures and methods for transitioning from an automated to a manual mode of operation.

5.2.2.2 Areas of Evaluation: C, D, J.

5.2.2.3 Test Method -(TBD by FIG).

5.2.2.4 Resources - (TBD by FIG).

5.2.2.5 Analysis - On the spot evaluation of ability to transition from Automated to Manual mode of operation. Adequacy of procedures to complete transition with no loss of data.

5.2.3 TR-63 FLOP

(Functional Laps of Operational Processing)

5.2.3.1 Purpose

To validate the procedures to be applied during an unscheduled shutdown (failure) of the automated system, for transition to a manual operation, and insure no loss of data or separation.

5.2.3.2 Areas of evaluation: C, D, I, M.

5.2.3.3 Test Method - (TBD by FIG).

5.2.3.4 Resources - (TBD by FIG).

5.2.3.5 Analysis - On the spot evaluation of the ability to make an orderly transition to Broadband Radar and/or manual operation with no loss of separation when the automated system fails.

5.2.4 TR-64 SORE

(Start Over and Recovery)

5.2.4.1 Purpose

To validate the procedures for recovery of the automated RFP system following a FLOP.

5.2.4.2 Areas of Evaluation: C, D, I, M.

5.2.4.3 Test Method - (TBD by FIG).

5.2.4.4 Resources - (TBD by FIG).

5.2.4.5 Analysis - On the spot evaluation of the ability to make an orderly recovery of the system failure.

5.3 IF-60 Internal Failure (IF) Tests

Internal failure tests must be conducted to determine:

a. The capability of continued system operation with momentary and extended failure of DPS elements, various combinations of I/O devices, and power.

b. The ability of the software operators and users to identify, isolate, and correct or replace malfunctioning elements or devices during continued operations.

c. The extent of processing which can occur without loss of data or operational capability.

d. The degree of processing which can be maintained in a degraded mode.

e. The operational acceptability of adapted backup devices for all sectorization plans.

IF tests require an operating system and are designed for "overlay" with any RF test. IF testing can be accomplished during the last part of the RF test after the RF test has been determined to have satisfied the primary objective.

5.3.1 IF-61 DPS Element Failure - Single/Multiple

5.3.1.1 Purpose

See paragraph 5.3, a,b,c, and d.

5.3.1.2 Areas of Evaluation: G, H, I.

5.3.1.3 Test Method - (TBD by FIG).

5.3.1.4 Resources - (TBD by FIG).

5.3.1.5 Analysis - Detailed analysis of reduced data to verify no loss of data. On the spot evaluation of impact on operations.

5.3.1.6 Procedures

The SE will direct the inducement of failures, individual and multiple, on various DPS elements. Failures will be induced through turning off of power, inducement of solid logic errors, and use of messages at the CDT.

The redundant element/elements will be available to the operational system and will be processing off-line "jobs".

The SE will verify that status indications, as well as MSP and CDT printouts, are as specified, and that the replacement and reconfigurations of the computer elements are successful.

AT observers will record the results of the operational program's automatic recovery of data to maintain an operationally suitable system.

Several elements may be failed in succession during a single test mission; however, the system should be stabilized prior to each separate failure.

5.3.2 IF-62 PVD Failure - Single/Multiple

5.3.2.1 Purpose

To determine the operational impact of single and multiple PVD failures and verify that the adaptation and procedures are adequate to minimize the impact and support continued operation with no loss of data or separation.

5.3.2.2 Areas of Evaluation: G, H, I.

5.3.2.3 Test Method - (TBD by FIG).

5.3.2.4 Resources - (TBD by FIG).

5.3.2.5 Analysis - On the spot evaluation of the operational impact and detailed analysis of reduced data to verify no loss of data.

5.3.2.6 Procedures

The SE will direct the inducement of various equipment failures. The AFS technician, under direction of the SE will initiate device recovery procedures for selected tests.

Multiple failures of the primary and backup PVDs must be induced to ascertain operational impact.

5.3.3 IF-63 PVD CED Failure

5.3.3.1 Purpose

To determine the operational impact of single and multiple CED failures and verify that adaptation and procedures are adequate to minimize the impact, and support continued operation, with no loss of data or separation of traffic.

5.3.3.2 Areas of Evaluation: G, H.

5.3.3.3 Test Method - (TBD by FIG).

5.3.3.4 Resources - (TBD by FIG).

5.3.3.5 Analysis - On the spot evaluation of the impact on operation. Detailed analysis of reduced data to verify no loss of data.

5.3.3.6 Procedures

Operator/Test Observer scripts will contain "failure actions" such as making CED not ready at specified time.

Severity of failure will include fast recovery as well as full replacement. Methods of inducing failures will be determined by the SE.

5.3.4 IF-64 CDT Failure Single/Multiple

5.3.4.1 Purpose

To verify adaptation and procedures for operation when single or multiple device failures occur.

5.3.4.2 Areas of evaluation: G, H, I.

5.3.4.3 Test Method - (TBD by FIG).

5.3.4.4 Resources - (TBD by FIG).

5.3.4.5 Analysis - On the spot evaluation of the impact on operations. Detailed analysis of reduced data to verify no data loss.

5.3.5 IF-65 Main Power Failure

5.3.5.1 Purpose

To evaluate the ability to continue to operate or make an orderly recovery of system capability following transition to and from generator power.

This test should include scheduled and unscheduled changes to generator and commercial power.

5.3.5.2 Areas of Evaluation: G, H, I, O, P.

5.3.5.3 Test Method - (TBD by FIG).

5.3.5.4 Resources - (TBD by FIG).

5.3.5.5 Analysis - On the spot evaluation of procedures for system recovery and impact. Detailed analysis or reduced data to verify no loss of data.

5.3.5.6 Procedures

While system is operating for any RF test, both planned and unplanned changes from generator to commercial power will be made.

The SE will be responsible for "turning off" of power at main BUS for unscheduled power changes.

The Test Manager will be responsible for coordination of planned changes.

The system must be stabilized prior to subsequent changes.

The computer operator, SE and Test Manager will take appropriate action to continue or recover operations following the failures.

5.4 External Failures (EF) Tests

External failure tests must be conducted to determine:

a. The ability to continue system operation with momentary or extended outages of single and various combinations of external interfaces or devices.

b. The ability to identify, isolate, and replace or repair the malfunctioning interface.

c. The extent of failure which can be accommodated without an adverse impact on the system.

d. The suitability of adapted supplemental radar for continued operation.

5.4.1 EF-61 CD/WFMU Failure

5.4.1.1 Purpose

See paragraph 5.4 a,b,c, and d.

5.4.1.2 Areas of Evaluation: G, H.

5.4.1.3 Test Method - (TBD by FIG).

5.4.1.4 Resources - (TBD by FIG).

5.4.1.5 Analysis - On the spot evaluation of impact on system operation and procedures, with detailed analysis of reduced data to verify no loss of data.

5.4.1.6 Procedures

Operating stable system with on-line radar inputs. SE will direct technicians at remote site to take action required to produce effect of failure.

5.4.2 EF-62 Interface Failure (NAS/ARTS)

5.4.2.1 Purpose

See paragraph 5.4 a, b, and c.

5.4.2.2 Areas of Evaluation: G, H.

5.4.2.3 Test Method - (TBD by FIG).

5.4.2.4 Resources - (TBD by FIG).

5.4.2.5 Analysis

On the spot evaluation of impact on system operation and procedures for recovery of failed site, as well as continued operation without the interface.

Detailed analysis of reduced data to verify no data loss.

5.4.2.6 Procedures

When RF mission is stabilized with on-line interfaced facility inpts, the SE will direct the AF sector technician to disable the appropriate interface.

5.5 Data Base (DB) Tests

Data base testing is designed to validate the operational adaptation, as well as the procedures for use of support software for building and maintenance or update of adaptation, and simulation bulk store tapes/file.

DB Tests should be scheduled as required to support testing, and need not be executed simply for evaluation.

5.5.1 DB-60 Adapted Parameters

5.5.1.1 Purpose

To verify that the parameter settings established are optimum for the support of the operational system, as well as establish appropriate procedures for changing of parameters and validation of new parameter settings.

5.5.1.2 Areas of Evaluation: K, L.

5.5.1.3 Test Method

Off-line system build, and/or on-line input of new settings for dynamic parameters. Operation of system using any RF test to determine impact/validity of system output, as well as procedures for operation.

5.5.1.4 Resources - (TBD by FIG).

5.5.1.5 Analysis

Detailed analysis of reduced data from brief runs of the operational program with the "varied" parameter settings to determine the effect of various settings on I/O.

5.5.1.6 Procedures

Static parameters will be set (adapted) at the suggested optimum settings and used for RF testing. Where it is determined that different settings may provide a more usable or timely output, new settings will be adapted (or "moded") and the same test rerun and analysis performed. Dynamic settings may be changed during a single run; however, the same data should be input after any change, and the output compared. Once parameters have been established as satisfactory, they should be noted as the standard settings for that site.

Parameter changes will be accomplished in accordance with applicable User's and Operator's Manuals and CPFSs.

The procedure for, and operation of, required support programs for implementing parameter changes must also be validated.

5.5.2 DB-61 Adaptation Generation

5.5.2.1 Purpose

To validate the procedures for initial system "builds" and periodic updates of the adaptation data base. Verify the ability of the DSSs and SPSs to operate the required support programs for building or updating center adaptation. Validate the procedures for verification (baselining of system prior to placing a new system into operation).

5.5.2.2 Areas of Evaluation: K, L.

5.5.2.3 Test Method

As required, new system builds or updates will be accomplished on an off-line system. New systems will be verified using the "Baseline," and any identified adaptation problems corrected. The new system will then be verified during scheduled RF test missions or during periods of light traffic during system shakedown.

5.5.2.4 Resources - (TBD by FIG).

5.5.2.5 Analysis

On the spot evaluation of procedures for system build or update. Detailed analysis of reduced data to validate tape following baseline. On the spot evaluation of procedures for placing a new or updated system into use, with detailed analysis of any problems encountered.

5.5.2.6 Procedures

New or updated systems will be built in accordance with applicable User's and Operator's Manuals and CPFSs. When adaptation changes are made which dictate a change, the baseline tape/tapes will be updated.

The new system will be verified through use of the "Baseline." When a system is determined to be satisfactory, it will be further verified by use in a retest of provisional RF tests or during periods of light traffic when in System Shakedown.

5.5.3 DB-62 Device Adaptation

5.5.3.1 Purpose

To verify the procedures, support programs, and ability of personnel to incorporate and validate new device adaptation and device address changes.

5.5.3.2 Areas of Evaluation: D, K, L.

5.5.3.3 Test Method

As required device adaptation will be updated to accommodate new I/O devices and interfaces, sectorization changes, or address changes; these changes will be made on an off-line system, using appropriate Operator's and User's Manuals and CPFSs.

When new or updated system meets baseline requirements, it will be released to operations and/or the Test Team for use in RF testing or light traffic during System Shakedown.

Information on incorporated changes should accompany the tape. Device and address changes must be validated with an appropriate internal and external failure test to verify proper routing of I/O to primary and secondary devices.

5.5.3.4 Resources - (TBD by FIG).

5.5.3.5 Analysis

On the spot evaluation of procedures and support programs for system build and update of device records.

Detailed analysis of reduced "Baseline" I/O data for validation. On the spot and detailed analysis of data following RF and IF, or EF, mission.

5.5.3.6 Procedures

The new or updated system will be built on an off-line system in accordance with applicable User's and Operator's Manuals and CPFSs. When new devices are incorporated, the "Baseline" tapes may also require updated I/O data.

After build, the new or updated system will be verified using the system "Baseline" tapes. When the system is determined to be satisfactory, it will be evaluated using the appropriate RF and IF or EF integration test. It should then be introduced to live testing in a Shakedown mode during light traffic.

5.5.4 DB-63 Radar Adaptation Validation

DB-63 will be accomplished in three tests which are as defined in the SINE Surveillance System Test Specifications (document SINE-331-1) and Test Procedures (document SINE-431-1).

These tests are defined in the referenced documents and will not be redefined in this document beyond assignment of the appropriate subtest to DB test.

5.5.4.1 DB-63.1 Weather and Fixed Mapping Unit (WFMU) Masking

(AAF Define)

5.5.4.2 DB-63.2 Radar Data Count

(AAF Define)

5.5.4.3 DB-63.3 Registration Data Accuracy

(AAF Define)

5.5.5 DB-64 Baseline Maintenance

Maintenance of Baseline is mandatory for conduct of efficient testing. As new functions are incorporated in the operational programs or adaptation changes/modifications are made, sites must have an expeditious means of validating the "system" prior to exposure to full RF type SI testing. Therefore, the "Baseline" must be updated to provide a comprehensive and thorough validation.

5.5.5.1 Purpose

To verify that procedures are adequate for maintenance of Baseline tapes; that the Baseline is satisfactory for validation of new and updated operational systems.

5.5.5.2 Areas of Evaluation

H, K, L

5.5.5.3 Test Methods

a. Baseline simulation tapes using off line system.
b. Validate Baseline tapes using latest system operation tape and operational system configuration.

5.5.5.4 Resources

(TBD by FIG)

5.5.5.5 Analysis

On the spot evaluation of procedures for and operation of support programs for maintenance of Baseline tapes.

Detailed analysis of output produced when Baseline is run with the operational program to determine adequacy of test data for validation of the operational system.

5.5.5.6 Procedures

Test analysis team, or individuals responsible for test data preparation, will generate and update this Baseline on the offline system, using appropriate support programs in accordance with applicable tape generation.

This procedure requires repeated and continuous updating of Baseline whenever program modifications, or new programs, are distributed with change, or add new functions to the operational software. The "Baseline" must be carefully scrutinized to determine if changes or new data inputs are required to validate the new or modified functions in the operational tape.

5.5.6 DB-65 - Bulk Store Flight Plan File Maintenance

5.5.6.1 Purpose

Validate the procedures for and ability of the Data Systems Staff to properly generate and maintain the required tapes of files for Bulk Store Flight Plans. To verify that generated tapes and files operate properly and produce the required output.

5.5.6.2 Areas of Evaluation

M and N.

5.5.6.3 Test Methods

Off line building of required files (tapes) using appropriate Operators' and Users' Manuals. These files should be built for support of testing as well as operations. Bulk Flight Plan for testing should use the same flight plans as the operational Bulk Store File, but unique Flight Identification should be utilized to avoid any confusion with actual traffic during testing.

5.5.6.4 Resources

(TBD by fIG)

5.5.6.5 Analysis

On-the-spot evaluation of procedures for, and operation of, support programs for maintenance of Bulk Store Flight Plans.

Detailed analysis of output produced when generated update or new tapes are "run" with the operational program to verify that output is adequate for support operations.

5.5.6.6 Procedures

Individuals responsible for preparation or maintenance of the Bulk Store Flight Plans records will generate tapes as required for testing and/or operation using the off line system.

Test files and tapes should as nearly as possible duplicate those required for support of operation. In this regard, it is not necessary to amass large quantities of data for test purposes.

After files or tapes have been generated or updated, they must be validated by using them as an input to the operational program during scheduled RF tests.

5.6 MP-60 Maintenance Procedures Validate (MP) Testing

Maintenance testing is designed to fulfill a "threefold" purpose:

a. To validate the procedures for performance of required maintenance.
b. To assure that the system is properly maintained and certified throughout the test effort.
c. To verify that the AF Sector personnel are proficient in the accomplishment of the required maintenance.

The tests defined in the following paragraphs are designed to provide direction for accomplishment of maintenance, procedures validation, proficiency, and requirements for the performance of maintenance.

This testing should be accomplished in support of RF, EF, IF, and DB testing throughout the test effort.

5.6.1 MP-61 Preventive Maintenance

Preventive maintenance should be performed as required on all equipment.

5.6.1.1 Purpose

To validate the procedures for completion of required preventive maintenance and provide time requirement for scheduling of equipment without interference to the operations and test/implementation effort.

5.6.1.2 Areas of Evaluation

G, H

5.6.1.3 Test Methods

As specified in AØ (Program Model-Version).

5.6.1.4 Resources

(TBD by FIG)

5.6.1.5 Analysis

On the spot evaluation of proficiency, with certification of maintenance performed, through use of appropriate maintenance programs.

5.6.1.6 Procedures

Maintenance of the various equipment will be scheduled as required. Tests will not be run for the express purpose of validating the procedures, but rather the procedures should be validated in the course of performing scheduled maintenance.

Maintenance of the computer system and peripheral hardware should be scheduled in parallel with RF testing. Performance of the scheduled maintenance should be evaluated as to any impact on the "operational test system" and as to the procedures and methods of avoiding interaction and impact.

5.6.2 MP-62 Engineering Changes (ECs)

The performance of engineering changes is a twofold process of: one, completing the required modification to the specified equipment, and two, certification of equipment operation following the change.

5.6.2.1 Purpose

To verify the ability of the sector personnel to,accomplish the required ECs, and that procedures are established for conduct of the activity without impact on the operational system.

5.6.2.2 Areas of valuation

G, H

5.6.2.3 Test Methods

As specified in AØ (Program Model-Version).

5.6.2.4 Resources

(TBD by FIG)

5.6.2.5 Analysis

On the spot evaluation of procedures and proficiency. Detailed analysis of certification data to verify performance in accordance with approved specifications.

5.6.2.6 Procedures

Maintenance of the various equipment will be scheduled as required. Tests will not be run for the express purpose of validating the procedures, but rather the procedures should be validated in the course of performing scheduled maintenance.

Maintenance of the computer system and peripheral hardware should be scheduled in parallel with RF testing. Performance of the scheduled maintenenace should be evaluated as to any impact on the "operational test system" and as to the procedures and methods of avoiding system interaction and impact.

5.6.3 MP-63 System Certification for Startup (Daily)

The requirements for certification of the system prior to operational use must be established and refined during system testing. This can be accomplished during SI and SS testing as a prerequisite for all SF tests.

5.6.3.1 Purpose

To evaluate and validate equipment certification procedures and requirements in determining the status of the hardware subsystems prior to use in operations or system testing.

5.6.3.2 Areas of Evaluation

C, G, H

5.6.3.3 Test Methods

Sequential testing of the computer system and peripheral elements and devices through application of approved maintenance software and procedures.

5.6.3.4 Resources

(TBD by FIG)

5.6.3.5 Analysis

On the spot evaluation of proficiency of personnel and adequacy of maintenance software and procedures for certification of the system. Detailed analysis of discrepancies encountered to determine the corrective action required.

5.6.3.6 Procedures

Certification will be accomplished in accordance with certification requirements established in the EARTS Maintenance Handbook (Order 6195.XX) prior to "startup" of system for scheduled SI or SS RF tests.

5.6.4 MP-64 System Certification Periodic

Requirements for certification of the system following installation of new or modified equipment and certain certification requirements which are established on a periodic basis should be evaluated in a test environment to ascertain the status of the system and maintenance.

5.6.4.1 Purpose

To verify that procedures are adequate and personnel are proficient in the test technique and verify methods for certification of the system following installation of new equipment, or modifications of system equipment, or periodic certifications, as may be required.

5.6.4.2 Areas of Evaluation

C, G, H

5.6.4.3 Test Methods

Testing will include use of test software, hardware, and established procedures for system certification.

5.6.4.4 Resources

(TBD by FIG)

5.6.4.5 Analysis

On the spot evaluation of procedures and proficiency. Detailed analysis of any discrepancies.

5.6.4.6 Procedures

Tests will be performed in accordance with requirements in the EARTS Maintenance Handbook (Order 6195.XX) and appropriate equipment manuals.

5.6.5 MP-65 Radar Alignment Validation

While these tests are prerequisite to the use of radar inputs from a specific site for system testing, the ability of sector personnel to conduct specified testing and validate site alignment must be maintained, as these tests must be accomplished following changes or modifications to remote radar equipment or location.

The following tests will reference but not repeat the procedures contained in the Surveillance System Test Procedures (SINE 431-1) for subtests 1 through 4.

5.6.5.1 MP-65.1 Radar Site Location

5.6.5.1.1 Purpose

To verify that the reported geographic location (latitude and longitude) for each radar/CD site associated with an ARTCC meets established positional accuracy standards.

5.6.5.1.2 Areas of Evaluation

5.6.5.1.3 Test Methods

Use of recorded radar CD-inputs and SAFI data for comparison, see SINE 431-1 subtest 1.

5.6.5.1.4 Resources

As specified in SINE 431-1 subtest 1.

5.6.5.1.5 Analysis

Verify through analysis of recorded data, SAFI data, and "Cal Comp Plots" that each radar/CD site is within 1/8 nautical mile of the recorded latitude and longitude.

5.6.5.1.6 Procedures

See SINE 431-1 subtest 1.

5.6.5.2 MP-65.2 Target Position Accuracy

5.6.5.2.1 Purpose

To verify the accuracy of Search and Beacon target position information received from each radar/CD site to be interfaced with the EARTS and determine what, if any, radar/CD alignment corrections are required to meet predetermined performance standards.

5.6.5.2.2 Areas of Evaluation

5.6.5.2.3 Test Method

Comparison of data recorded at the EARTS with SAFI recorded data to determine any positional error.

5.6.5.2.4 Resources

As specified in SINE 431-1 subtest 2, NAFEC Library #72-1036.

5.6.5.2.5 Analysis

Recorded CD input and SAFI data will be reduced and plotted to ascertain that the mean positional error with at least 30 data samples does not exceed 1/8 nautical mile in range or 1 ACP in Azimuth for Search and Beacon data; and that the standard deviation does not exceed 0.16 nautical miles in range for Search and Beacon or 3.9 ACPs for Beacon or 2.6 for Search in Azimuth.

5.6.5.2.6 Procedures

See SINE 431-1 subtest 2.

5.6.5.3 MP-65.3 Beacon Data Base

5.6.5.3.1 Purpose

To investigate areas of Beacon multipath target reports and to identify, wherever possible, the cause of the multipath returns.

5.6.5.3.2 Areas of Evaluation

5.6.5.3.3 Test Methods

Use of SAFI and beacon equipped targets of opportunity recorded in all quadrants of the radar/CD sites.

5.6.5.3.4 Resources

As specified in SINE 431-1 subtest 3, Library #72-1036.

5.6.5.3.5 Analysis

Detailed analysis of reduced data generated by playback of the recorded data to determine areas of multipath returns.

5.6.5.3.6 Procedures

See SINE 431-1 subtest 3.

5.6.5.4 MP-65.4 Collimation and Channel Alignment

5.6.5.4.1 Purpose

To verify that all Search and Beacon radar channel equipment is in proper alignment at each radar/CD site to be interfaced with the EARTS.

5.6.5.4.2 Areas of Evaluation

5.6.5.4.3 Test Methods

Search permanent echos will be used to verify that alignment is correct with recorded SAFI and targets of opportunity data through use of the CD maintenance program.

5.6.5.4.4 Resources

As specified in SINE 431-1 subtest 4.

5.6.5.4.5 Analysis

Data will be analyzed to verify that target information from each radar/CD site is within 1/8 nautical mile of range and 1 ACP of Azimuth.

5.6.5.4.6 Procedures

See SINE 431-1 subtest 4.

5.7 OD Requirements

Prior to the scheduling of the operational demonstrations (OD) at the first site or declaration of OD by subsequent sites, all tests in SI must be satisfactorily completed.

Test results will be documented and test output, logs, and reports will be available to cognizant parties for independent analysis, as may be required, to ascertain that required testing has been satisfactorily completed and OD achieved. FIG must verify that sufficient people will be trained to a level that adequately supports the testing after OD.

5.7.1 OD Documentation

A demonstration will be conducted by the first site to reach this status in implementation. Other sites may, at the direction of the Region or the operating services, be required to conduct a formal OD demonstration, or sites may, at their discretion, choose to conduct a formal OD demonstration.

5.7.1.1 Demonstration Requirements

The following are the minimum requirements for a formal OD demonstration and may be added to by the facility when determined desirable.

Any additional requirements which may be desired by the Regional Operating Service must have the concurrence of Region, AFS & ATS.

5.7.1.1.1 Purpose

The OD demonstration is intended to afford cognizant organizations the opportunity to examine the functional capability of the system, the adequacy of procedures for operation and maintenance, and the operational acceptability of the system.

5.7.1.1.2 Duration

The OD demonstration is not intended to be an "endurance" test. However, it should be scheduled for a period adequate to demonstrate the START, FLOP, SORE, and STOP capabilities, as well as operational processing of on-line radar inputs sufficient to demonstrate the capability of the system and to support the facility operationally.

In addition, operation of FOSS, SUPPORT and maintenance software, concurrent with the operational software, should be demonstrated. All I/O for the demonstration must be in a test environment; i.e., should not be used for the control of actual traffic. This does not preclude the use of on-line live radar inputs for display on the narrowband display; however, the narrowband system is not to be used for actual control of air traffic. A two to four hour demonstration period is estimated to be adequate.

5.7.1.1.3 Resources

Staffing: Normal day watch staffing of DSS and AF personnel with adequate test operators to support the planned demonstration.

Configuration: EARTS with off-line system used for concurrent support and maintenance activities.

5.7.1.1.4 Areas of Evaluation

All

5.7.1.1.5 Analysis

On the spot evaluation by cognizant organizations. In addition, hard copy output, CDR Editor output, logs, and reports of previous testing should be made available to the evaluators. This detailed analysis may be accomplished several weeks prior to the scheduled OD demonstration, but in no case should other than the final report of the evaluation team be required, during the demonstration, as part of the demonstration.

5.7.1.1.6 Procedures

The FIG should notify AAF-600 of the planned OD demonstration or declaration at least ten days prior to the scheduled date. Documentation and test output should be available on site. For the demonstration, a combined RF/SS/DB and MP test should be conducted using on-line and simulated inputs.

Traffic Loading during the test should approximate the facilities' peak day traffic for at least 30 minutes of the test. Procedures for the demonstration should be the refined procedures for the required combination of SI tests.

Test data listings will be available for examination by interested parties. JAI reports will be available on all hardware systems to be demonstrated.

Discrepancies in the system which must be resolved prior to the start of system shakedown testing or ORD will be documented and noted in the OD Report. Successful achievement of OD will be attested to by representatives of: the Facility, Sector, Region, and the Operating Services.

6.0 SYSTEM SHAKEDOWN

System shakedown testing is intended to be accomplished using the radar data processing capability of the operational software system at the facility.

System shakedown requires the use of the total system in actual control of Air Traffic. Therefore, test procedures must include methods of data validation prior to using A for control. All shakedown testing is accomplished through application of the "operational" procedures which were developed and refined during System Integration Testing.

Testing during shakedown consists of the exercise of transition procedures and operational procedures in increasingly heavy traffic. The following procedures will be used for guidance in the conduct of all tests and individual tests will not be addressed.

6.1 Test Methods

All the methods described in paragraph 5.6 may be adapted for use in system shakedown. While "Phased and Procedurally Limited I/O" methods may be employed for some stages of shakedown, the final result should be the commissioning of the "total" RDP capability. Sites are not restricted as to test methods employed; however, the validation of data for control must be adhered to.

6.2 Required Tests

All system shakedown tests listed in the Test Specifications must be completed prior to ORD of the system.

These tests are repetitive and should be run during varying periods of the day to achieve the desired traffic loading. In the completion of the transition tests, it should be understood that FLOPs will not be induced during shakedown when "live" traffic is being controlled. These procedures should be evaluated only as a result of actual failures. Should re-evaluation of failure and recovery procedures be deemed necessary during system shakedown, the re-evaluation should be accomplished in an SI test environment, or with all traffic separated in accordance with non-radar separation standards.

Care must be exercised to assure that progression to heavier traffic periods is only accomplished when procedures, radar tracking performance, and personnel proficiency have proven to be adequate for support of the ATC task.

6.3 Data Verification During System Shakedown

During system shakedown testing, the EARTS will be used for the actual control of Air Traffic. The "test facility" must verify the accuracy of output data to assure that air traffic safety is not compromised. While the method and frequency of data verification remains the prerogative of the facility, the FIG must assure that, at least, the following minimal validation is accomplished.

6.3.1 Verification of Radar Data Processing

During system shakedown (SS) testing of the RDP system, the FIG must assure that the accuracy of RDP output is validated by one of the following methods prior to use of the digital (narrow-band) system for actual control of aircraft.

6.3.1.1 Operational Monitor

Where the capability exists, the accuracy of the narrowband system can be verified by periodic comparison of the digital display to the operational display of the same area. This should not be construed to indicate that a "one-for-one" operational monitor capability is required. "Side-by-side" digital and operational displays on a one-for-one basis is optimum; however, one operational display can be used for monitoring several narrowband sectors.

6.3.1.2 Verification on Handoff

Use of handoff procedures, as specified in ATP-7110.65, Chapter 4, Section 5, for transfer of control of a target from a commissioned, or verified digital radar system (intracenter or interfacility) to a digital display, satisfies the verification for the flight being handed off.

6.3.1.3 Verification by Position Report

Position accuracy of digital display targets may be validated by requesting a pilot report of position in relation to a fix displayed on the video map.

6.3.1.4 Verification by Radar Identification Procedures

When radar identification is established through application of the Radar Identification procedures specified in ATP-7110.65, accuracy of the digital display target is verified.

6.3.2 Separation of Verified Digital display Traffic

When the position accuracy of a target has been verified through application of one or more of the methods specified in 7110.65, separation shall be provided in accordance with digital separation minima as specified by FAA Handbook 7110.65, or changes thereto.

6.3.2.1 Separation of Handoff

Due to target size differentials between digital and operational targets, controllers transferring control from a digital system to an operational system must assure that separation will exist when control is transferred to the operational sector/facility.

6.3.3 Non radar Separation

When non radar separation is provided, verification of display accuracy is not required. However, verification as specified in 7110.65 must be accomplished prior to providing vectors with the digital system.

6.4 Operational Readiness Demonstration (ORD)

Upon determination by the FIG that the hardware, software, personnel proficiency, and operational procedures are satisfactory for support of the Air Traffic Control Task, the facility, through the Region, shall schedule and complete a demonstration of the system, and the final system JAI.

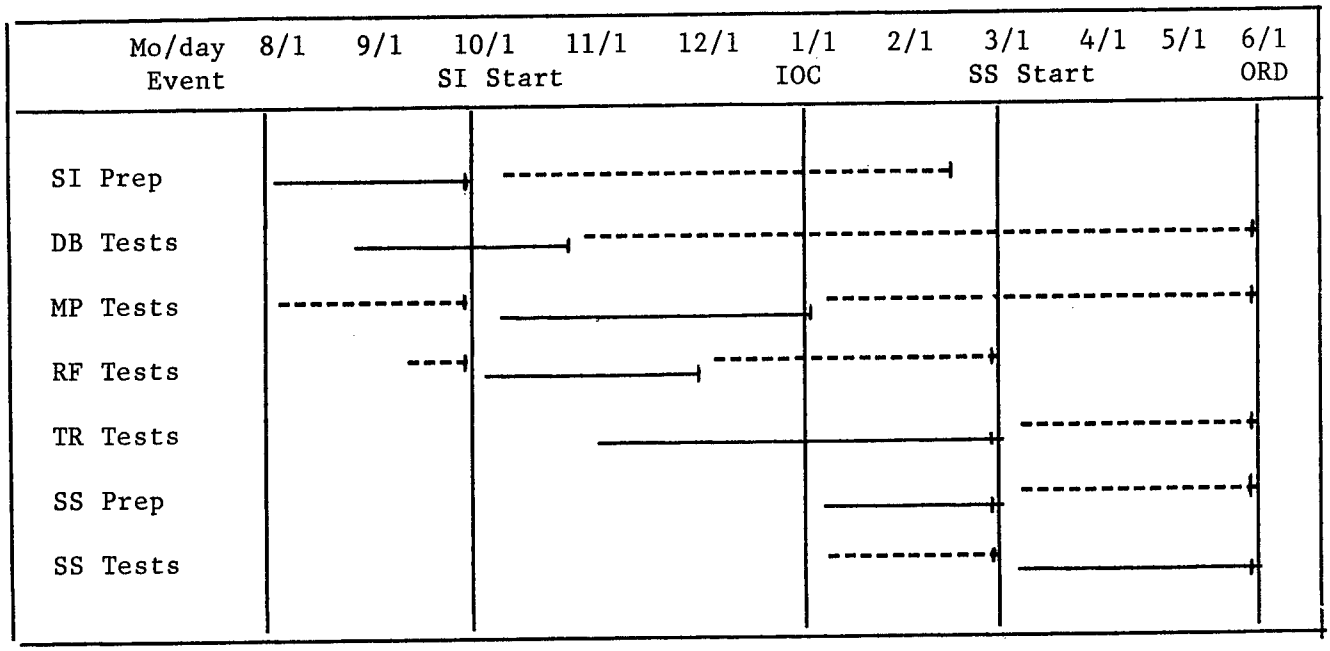
7.0 TEST SCHEDULES

Tables 7.1 and 7.2 are to be completed by the Site FIG. Table 7.2 is a detailed test mission schedule projecting the planned daily schedule through ORD.

7.1 Long Range Schedule

Table 7.1 is to be inserted by the site to show the local overall SI/SS schedule.

SI/SS LONG RANGE SCHEDULE



\- - Scheduled Testing (Testing of various areas will be done on alternating days.

------- As required - intermittant testing.

SAMPLE TABLE 7.1

7.1.1 Scheduling Considerations

Sites must have test progression on: availability of personnel, proficiency of personnel, hardware availability, data analysis requirements, and repetitive test requirements.

7.1.1.1 Repetitive Testing

Tests should be rescheduled, as required, for proficiency development of all personnel.

Retesting for validation should be planned following adaptation and/or system tape updates.

7.1.1.2 New Tape Bringup

During SI testing, the use of new versions or models of systems should be phased into testing as soon as possible. The use of new systems may require the re-running of previously completed tests; however, validation of new systems should not require a total retest of the new tape prior to use in SI.

During system shakedown testing, the new system tape must be validated to the same level as the system which it is replacing.

7.1.1.2.1 Schedule Impact

Time frames for SI and SS testing are based upon the requirement for "Bringup" of new systems tapes. Locally prepared SI and SS test schedules should accommodate bringup of new system tapes projected for delivery during these test phases.

New system tape deliveries should not require a delay in achievement of "milestone" events such as Start of SI or SS, or completion of OD or ORD.

7.2 Detailed Schedules

Detailed schedules will be prepared by the FIG at each site and inserted in place of the present Table 7.2. Table 7.2 will project the missions and tests to be run daily for thirty-day periods.

7.2.1 Initial Detailed Schedule

Each site FIG will prepare a detailed schedule (Table 7.2) to show the entire SI/SS test effort. This initial detailed schedule (Table 7.2) will be updated as required by the site, and distributed to remote sites and interfacing facilities as far in advance of test schedule changes as possible.

7.2.2 Updates to Detailed Schedules

Updates for Table 7.2 should be inserted, as required, to accurately project planned testing. Sites may choose to update the 7.2 schedule on a 30 day basis to incorporate any changes required for the next 30 day period. Changes which occur after the 30 day schedule has been distributed do not necessarily need to be incorporated in a change to 7.2, but can be accomplished through appropriate Mission Test Orders.

DETAILED TEST SCHEDULE

(TO BE COMPLETED BY SITE TMO)

TABLE 7.2

8.0 REQUIRED REPORTS

The following reports must be maintained by the site and, where specified, submitted to Headquarters.

8.1 Mission Test Reports

Mission Test Reports for missions completed prior to completion of OD or ORD should be maintained on site and be made available for examination by Regional, ATS, AFS or Contractor personnel, as may be requested, until the OD, ORD, and/or Final Report has been submitted.

8.1.1 Supporting Documents

All hard copy outputs, Observer/Operator logs, CDR Editor listings, and Program listings should be maintained on site through OD or ORD until Final Test report has been accepted.

8.2 Weekly Test Progress/Status reports

Test progress will be reported to AAF-300 and NAFEC (AAT-550) via TWX on the first "administrative work day" of each week. The report will cover the status of the testing and weekly progress through ORD.

8.2.1 Report Format

The report will be in the format shown in Attachment 7 .

8.2.2 Report Submission

The report should be submitted via TWX as early as possible, preferably no later than twelve o'clock of the first working day following the tweek which the report covers. The report should be addressed to AAF-300 and NAFEC, Attention: EARTS Field Support, AAT-554.

8.2.3 Report Contents

Data for the report should be calculated and submitted in accordance with the instructions contained in Attachment 7 .

8.3 OD Report

Within thirty-days following the declaration of OD, a report summarizing the test activity leading to OD and the status of the system at OD, will be submitted to AAF-300 and AAT-554.

This report should include a list of any discrepancies which are outstanding against the system at OD. Any discrepancies which must be resolved prior to use of the system for system shakedown or ORD should be noted.

8.4 Final Test report

Within thirty days following completion of ORD, a Final Test report will be submitted summarizing the test activity between OD and ORD.

At the discretion of the FIG, a System Integration Report may be submitted covering test activities through completion of SI. When a System Integration Report has been submitted, the Final Test Report need only cover the system shakedown activity.

GLOSSARY

A (position)	Assistant (Developmental) Controller.
"A" Supervisor	The individual in some ARTCC's responsible for direct supervision of assistant controllers and the Flight Data Operation.
Academy	The FAA training facility at Oklahoma city, OK.
Adaptation	The process of gathering all data in the format required to allow the program to properly process radar data for the EARTS facility.
ADIZ	Air Defense Identification Zone.
AF	Airway Facilities Sector, specifically the technicians responsible for maintenance of all hardware.
ARTCC	Air Route Traffic Control Center.
ARTS	Automated Radar Terminal System.
AT	Air Traffic, specifically the various facility, area, regional, and headquarters offices administratively responsible for the ATC operation.
ATC	Air Traffic Control.
ATS	Air Traffic Service - See AT.
Assistant Controller	Personnel in the various ATC facilities engaged in the ATC task below the controller level, commonly referred to as Developmental Controllers. The duties of these personnel generally include the processing and transfer of flight plan information.
Baseline	Composite, controlled information to be supplied to the program for verification of program and hardware functions. Generally stored on magnetic tape for use in verification of new programs or changes.
Briefing	In testing, a meeting of all test participants for the purpose of outlining the test activities and objectives.

Bulk Store File	Bulk Store File. A collection of scheduled flight plans stored on magnetic tape or disc for submission to the computer.
CCD	Configuration Control Directive. The order to implement changes to the NAS system.
CD	Common Digitizer. Equipment for conversion of analog radar data to digital radar data for transmission by narrowband methods for use by the DPS.
CD Technician	AF personnel assigned to maintain the Common Digitizer equipment.
Checklist	A canonical, chronological list of the duties to be performed by a specific position.
CM	Corrective Maintenance.
CO	Computer Operator.
Controller	An individual in the ATC facilities directly engaged in the control of Air Traffic (AT).
Core	Ferromagnetic material in the computer which can be electrically charged to hold digital (binary) data or instructions for use by the computer program.
Core Dump	The recording of data in/from core. Generally written from core onto magnetic tape for later printing on the High Speed Printer through Core tape or Core Dump Tape.
CPFS	Computer Program Functional Specifications. Published as NAS-MDs.
CTS	Coded Time Source. A device for input of National Observatory Time to the computer.
D (position)	Manual (interphone) controller.
DARC	Direct Access Radar Channel. Device for use of digital radar data without the use of the CCC.

Data	Information, generally in a specified format for input, processing, or output to or by the computer.
Data Base	The information supplied through adaptation of bulk and simulation data for use by the computer.
DB	Designation of off-line Data Base maintenance testing.
DR	Discrepancy Report. A document for recording of problems in hardware operations.
DR&A	Data Reduction and Analysis. The printout of recorded data for analysis of program output and functioning.
DRAT	Data Reduction and Analysis Team. Those individuals directly responsible for the reduction and analysis of test data.
DRG	Data Receiver Group. Part of CD System for receipt of radar data.
DSO	Data Systems Officer. An individual in an ATC facility responsible for the operational use of the EARTS system.
DSC	Data Systems Coordinator. A Data Systems specialist (DSS) designated by the Data Systems Officer (DSO) to represent the AT watch supervisor in matters concerning automation.
DSS	Data Systems Specialist. An individual in the ATC facility training in programming and operation of the EARTS system.
DT	Display Technician. An individual in the AF sector responsible for maintenance of display equipment.
DTG	Data Transmission Group. Equipment for transmission of radar data, part of the CD.
EC	engineering Change. A specified modification to computer or I/O equipment.

EF	External Failures. Designation of tests related to the failure of devices and lines in the EARTS system external to the EARTS.
ELEMENT	Individual items of hardware which make up the computer system.
ETA	Estimated Time of Arrival. The time an aircraft is estimated to reach its destination or a particular point.
FAA	Federal Aviation Administration.
FDEP	Flight Data Entry and Printout. The I/O equipment installed at airport or ARTCC locations for input to and output from the computer.
FLIGHT DATA	Information on the proposed or actual flight of an aircraft. Also a designation of the area and personnel in the ARTCC for manual processing of the information.
FIG	Facility Integration Group. Facility AAT/AAF personnel responsive to the OER.
FLOP	Functional Lapse of Operational Processing. The failure of the computer to output or accept usable flight data.
FSS	Flight Service station
Hardware	The elements, devices, and other equipment which make-up the computer system and I/O subsystems of the EARTS system.
HOT	Hands-on-Training.
IF	Internal Failure. Tests concerned with the failure of elements or devices within the ARTSS
IFDS	Inter-Facility Data Set. Type I - Transmitter Only Type II - Receiver Only Type III - Transmitter and Receiver Device for transfer of data between automated facilities and radar sites.

I/O or IO	Input/Output. Devices for input and output of data to and from the computer.
I/O Technician	AF personnel assigned to maintain the I/O equipment in the EARTS.
JAI	Joint Acceptance Inspection.
LIVE	Refers to the operation in support of the actual Air Traffic Control task.
MDM	Maintenance Diagnostic Monitor. The software used by the AF technicians to locate hardware malfunctions and verify maintenance performed.
Mission	The scheduled test or tests for a particular purpose and time.
MODEM	Modulator - Demodulator. A portion of the IFDS.
MP	Designation of testing concerned with the performance of maintenance on the operational system.
MSP	Medium Speed Printer.
NAS	National Airspace System. In test documentation generally refers to the use of computers in the processing of flight data.
NCP	National Airspace System Change Proposal.
Narrow-band	The conversion of data to digital form for transmission over voice type lines or channel.
Observer	A position used during testing to designate individuals responsible for the gathering of test results and direction of operation.
O.E.R.	Onsite Engineering Representative.
Off-line	Local I/O and peripheral devices operated as a part of the off-line system.
OJT	On-The-Job-Training.
On-line	Local I/O and peripheral devices operated as a part of the operational system.
Operator	Individual responsible for the operation of specific equipment in support of a test or mission.

ORD	Operational Readiness Demonstration. A formal demonstration of the capability of the system to support the real-time ATC task.
Overlay	A designation used to specify those tests which can be evaluated in conjunction with the conduct of other tests.
Participant	Any individual, test manager, operator, observer, etc., who is directly involved in the conduct of a test.
PM	Preventive Maintenance.
PMSR	Program Maintenance Status report. A periodic publication which lists modifications made to the software system.
Primary	The designation of specific tests for evaluation of major system functions.
PTR	Program Trouble Report. A form for recording and reporting areas where the software does not conform to the CPFSs.
PVD	Plan View Display.
R (position)	Radar Controller.
RDP	Radar Data Processing. That part of the operational program which provides for processing of Radar I/O.
Real Time	Refers to the input of data by interfaced devices as opposed to use of recorded (Tape or Disc) data.
RF	Routine Functions. Designated specific test areas for evaluation of program and I/O functions.
SCOPE	System checkout of Peripheral Equipment. A software system for the verification of the operation of NAS I/O equipment.
RIG	Regional Integration Group. Regional personnel responsible for implementation of EARTS system. O.E.R. Chairman.

ATTACHMENTS

1. Pre and Post Test Checklist
2. EARTS Center Mission Test Order-Local
3. EARTS Center Mission Test Order-Remote
4. Pre and Post Test Briefing Guides
5. Observer Log and Problem Report Form
6. EARTS Test Mission Report
7. Weekly Test Progress report

ATTACHMENT 1
(SHEET 1)

PRE-TEST CHECK LIST

TEST MANAGER

Required Yes	Required No	Completed	Action:
___	___	_____	System Scheduled and available.*
___	___	_____	Required Operators/Observers available for test.*
___	___	_____	Hardware System confidence Check completed and discrepancies noted or corrected.
___	___	_____	System I.D._____current and available.
___	___	_____	BULK I.D._____current and available.
___	___	_____	Other required tapes/discs_____, _____, _____, _____, _____ available.
___	___	_____	Briefing space available and test participants informed of place and time.*
___	___	_____	All required test material available locally and at remote sites: MTO, Scripts, Logs, etc.*
___	___	_____	Pre-test briefing completed.
___	___	_____	All operators and observers assigned, understand test requirements, and at their positions.
___	___	_____	Initialization decks for Start-up and Start-over current and available.
___	___	_____	Test clocks set and all test participants informed of proper test start time.

The Test Manger should indicate as completed those items marked "X" in the yes column, prior to commencing the test.

*NOTE: These items require action up to one week prior to the scheduled mission.

POST-TEST CHECK LIST

TEST MANAGER

The following must be verified and checked ( ) or marked not applicable (NA) by the test Manager after completion or termination of the test.

_____ Insure that test related output from on-line peripheral I/O devices collected and forwarded to DRAT.

_____ Assure all data recording tapes are properly marked and stored.

_____ Specify Data Reduction and Analysis as required.

_____ Collect Test Observers logs, scripts, IOT forms, MSP forms, test procedures, tapes, outputs, comments, and suggestions as required.

_____ Debrief EARTS Test Team Members.

_____ If remote facility test team debriefing necessary, arrange with remote facility watch supervisor within 15 minutes after scheduled test completion time. Conduct debriefing over most appropriate communications system.

_____ Contact radar facilities by telephone to collect reports of discrepancies encountered during tests.

_____ Analyze trouble reported and make recommendations as to solutions.

_____ Forward test records, Test Manager's and System Engineer's recommendations to appropriate group for further analysis.

_____ Advise AF maintenance to restore hardware to normal as appropriate.

_____ Store and label special test materials for future use.

ATTACHMENT 2

EARTS

ARTC CENTER MISSION TEST ORDER

LOCAL

TEST DATE:_____ TEST MANAGER:_____

MISSION NUMBER:_____ SCHEDULED TEST(S):_____

START:_____ END:_____

HARDWARE READINESS CHECK: BEGIN_____End_____By_____

TECHNICAL REPRESENTATIVE:_____

OVERLAY TESTS AND ADDITIONAL PERSONNEL:

1. _____position_____2. _____position_____

3. _____position_____4. _____position_____

BRIEFING: Remote facilities will be briefed via interphone beginning one hour prior to test start time as required.

PERSONNEL: (TBD by FIG)

SUPPLIES: AS SPECIFIED ON ATTACHED PRE-TEST CHECK LIST.

COMMUNICATIONS: (TBD by FIG)

SCRIPTS: 1. _____ 2. _____

3. _____ 4. _____

PARTICIPATING REMOTE FACILITIES: Indicate those required)

(TBD by FIG)

REMARKS:

ATTACHMENT 3

EARTS

ARTC CENTER MISSION TEST ORDER

REMOTE SITE

TEST DATE:_____ TEST MANAGER:_____

MISSION NUMBER:_____ START: _____ PDT END: _____ PDT

MISSION NUMBER:_____ START: _____ PDT END: _____ PDT

PERSONNEL: ATS Operator and/or Observer: As Required

AFS Technician: As Required

BRIEFINGS: Example: This test will include "real time" input and output only. No individual interphone briefings are planned, only normal coordination which will be required for the automated operation. DSS personnel will be available for questions at least 30 minutes prior to start time, and throughout the test as indicated below under communications.

COMMUNICATIONS: Interphone: (TBD by FIG)

FTS: During Test - (TBD by FIG)
Other Times - (TBD by FIG)

Commercial: (TBD by FIG)

DO NOT CALL THE WATCH SUPERVISOR

PRETEST DUTIES: Verify that equipment is ready; adequate paper or forms and all switches in the proper position. Send test message at start time.

POST-TEST DUTIES: If problems were encountered, mail a completed Observer Log and any erroneous output in the envelopes enclosed. If there were no problems or questions, return of the material is not required.

Test Coordinator

ATTACHMENT 4
(SHEET 1)

PRE-TEST BRIEFING GUIDE

The pre-test briefing of test personnel is an important step in the production of a well planned, successful test. The following list of possible subject items is to be used by the Test Manager as a guide only.

It shall be the responsibility of the Test Manager to determine the areas to be covered during briefings and the extent of coverage necessary to prepare personnel for a successful test.

Scope

Explain the general purpose of the test.

Test Areas

Describe areas to be tested.

Test Objectives

Be sure that all personnel are aware of what the test is meant to achieve.

Mission Test Orders & Test Procedures

Review.

Criteria

All personnel must know the Standards and Measures for the test.

Completion of reports & Logs

Review procedures for completion of Reports & Logs as necessary. Add any special instructions. Amount of data recorded must be sufficient to permit effective test analysis and reporting.

Personnel

Ascertain that all required personnel are in attendance. Brief personnel on collective and individual test duties.

Script

Insure that all personnel have copies and know their purpose. Insure that copies are current and correct.

Configuration

Describe configuration to be used during test.

Ground Rules

Review any ground rules relevant to test.

Equipment

List equipment to be used and any special tests or results expected from a particular piece or type of equipment.

Supplies & Forms

Distribute forms and supplies as necessary for use during test.

Emergency Action

Discuss procedures to be used in the case of an emergency situation or abnormal condition.

Communications

Designate the type of communications to be used.

Environment

Any unusual environmental situation should be explained.

Time

If timing of any segment of the test is of unusual importance, stress!

Any other information that may be important or helpful to the conduct of the test should be thoroughly covered.

POST-TEST BRIEFING

Guidelines for Post-Test Briefing must, of a necessity, be of a general nature. Coverage is dependent upon the test itself, how it was conducted, whether or not it was successful, knowledge gained that would be useful for future testing, and the type of tests that follow.

The debriefing should review the test in sufficient depth to provide the Test Manager with information that will enable him to decide how much Data Reduction and Analysis should be requested, whether or not retesting or additional testing is required, if recommendations should be made for equipment or software changes, and how to fill out reports.

Forms, logs and test materials should be collected and filed as necessary. Any other element of the test that can contribute useful knowledge should be discussed.

TEST OBSERVER LOG INSTRUCTIONS

Test Observer Log shall be completed as follows:

1. Facility (Remote & Local)

   A. The Facility name.

      (1) To be completed by the Test Observer pricr to test start.
      (2) Example: ZCS, TCM, etc.

2. Date/Time

   A. The Month/Day/Year/Time that the actual test is to take place. This time will be Greenwich Mean Time (GMT), not test time.

      (1) To be completed by the Test Observer prior to test start.
      (2) Example: 06/22/70/2200Z.

3. Test

   A. The test number/s that will be performed.

      (1) To be completed by the Test Observer prior to test start.
      (2) Example: RF 60, RF 62, etc.

4. Test Operator and Position

   A. The name of the Test Operator position of operation.

      (1) To be completed by the Test Observer prior to test start and when change of personnel occurs during test.
      (2) Example: Smith, J. L.

   B. Include the first and middle initial of each Test Subject.

5. Test Observer

   A. The name of the Test Observer.

      (1) To be completed by the Test Observer prior to test start.
      (2) Example: Brown, H. O.

6. Action Observed Time

A. The test time that the unexpected conditions occured in test time GMT, not actual GMT.

(1) To be completed by the Test Observer during test conduct.
(2) Example: 2215Z

7. Action Observed

A. A narrative description of the unexpected condition observed.

(1) To be completed by the Test Observer during test conduct.
(2) Example: Fix time not calculated correctly, route of flight incorrect, etc.

8. Page Number

A. A page number annotation to maintain continuity.

(1) To be completed by the Test Observer during test conduct.

This form is designed to record the Test Subjects actions and the unusual conditions occurring during test conduct.

TEST OBSERVER LOG

1. _____ (Facility) 2. _____ (Date/Time) 3. _____ (Tests)

4. _____ (Test Operator and Position) 5. _____ (Test Observer)

ACTIONS OBERVED

6. (Test Time)	7. (Narrative)

8. _____ (Page Number)

OPERATIONAL PROBLEM/MALFUNCTION

DATE:_____ TIME:_____ SECTOR:_____ NARROWBAND:_____ BROADBAND:_____

CONTROLLER:_____ CREW:_____ DSS:_____ ACID:_____

ID:_____ SYS TAPE ID:_____ TAPE ID:_____ SECTOR PLAN:_____

PLACE AN X THROUGH SELECTED KEYS AND PLACE CORRESPONDING DIGIT(S) OVER CONTROL SWITCHES

DISPLAY FILER KEYS

AIR IDENT	ASSIGNED ALT	REPORT ALT	COMPTR IDENT NO.
ESTAB BEACON CODE		LEADER	POS SUMBOL

_____ HISTORY

_____ VECTOR LENGTH

_____ RANGE

_____ LEADER LENGTH

CRD ALTITUDE LIMITS _____ B_____

PROBLEM: (Use reverse side if necessary)

ACTION ROUTING	DATE	ACTION REQUIRED	RECOMMENDATION/ ACTION TAKEN

SOLUTION: _____

DATE CLOSED: _____ SIGNED: _____

ATTACHMENT 6
(SHEET 1)

EARTS MISSION REPORT

MISSION_____TEST/TESTS_____TEST MANAGER_____

DATE OF TEST_____ACTUAL TEST TIME FROM 1900 PDT TO 2200 PDT.

SYSTEM ID_____

PATCHES_____INITIALIZATION DECK_____

CONFIGURATION

(TBD by FIG)

REMOTE SITES

(TBD by FIG)

MISSION SUMMARY:

NO. STARTUPS PLANNED 2 ACTUAL 4 NO. ABORTS PLANNED 1 ACTUAL 3

NO. STOVERS PLANNED 1 ACTUAL 3 NO. HARDWARE FAILURES several

MISSION OBJECTIVE: To simulate live traffic conditions as closely as possible. Run with all I/O except XXX.

TEST METHOD: LIVE, SIM, SCRIPTED, ETC., Scripted

REMARKS: SUCCESSFUL, UNSUCCESSFUL, VALID, RETEST REQUIRED, ETC.

Unsuccessful. see attachment.

(Example)

This test was designed to simulate live traffic as closely as possible. The data to be input by 1052 operators was in strip format. The teletype location input data was on flight plan forms. The FDEPs had no script but departed aircraft for which they received computer generated proposed departure strips.

IF-2 (CCC element failure) test was scheduled as an overlay test. Problems were encountered during the IF-2 test while failing elements. For example, when SE #1 was failed, the system aborted. IF-2 will need to be rescheduled.

IF-3 (power failure) test was also scheduled as an overlay test. The change from commercial power to standby power caused an unrecoverable abort. This test will be rescheduled when the RESCUE program is available.

Additional problems:

FDEP: SKA and BFI were out of service most of the test.

TTY: Line problems most of the test.

I recommend that the TELCO lines be upgraded. Also that the FDEP locations be visited by a member of the DSS staff.

Weekly SI/SS Test Progress/Status Report Instructions:

Initial Report:

All items 1 through 9 should be completed.
Only the item number and data for that item need to be transmitted.

Example

1. ZXX
2. 4/9/73
3. A. A3DK355Y/33F.6
   B. 1/15/73
   C. X103
   D. 1.) 309,601
      2.) 255,161
      etc.,)

9. I CARE, Test Coord.

Subsequent Reports:

Items 1, 2 and 9 must always be included. Other items need be included only when the information has changed since the previous report.

Weekly SI and SS Test Progress/Status report

To: AAF-600

Attention: AAF-620, AAT-530,
AAT-554, AAF-640

1. Site:
2. Date:
3. Program:
   A. Program Tape Level:
   B. Date Received:
   C. Adaptation Level:
   D. Total CORE Storage Requirements:
      1.) Program:
      2.) Adaptation:
   E. Expected completion date (SI or SS as appropriate):
   F. Expected IOC (or ORD) date:
4. PTR Activity:
   A. Number Opened to Date:
   B. Number Closed Locally to Date:
   C. Currently Open:
   D. Released to NFSG:
   E. Duplicates to PTRs in PSMR:
   F. Under Investigation Locally:
5.
   A. Test Phase: (SI or SS)
   B. *RF % Complete
   C. *IF/EF % Complete
   D. *MP/DB % Complete
   E. *TR % complete
   F. Total SI (or SS) % Complete
   G.+ SST Subtests:
      1. ___%, 2.___%, 3.___%, 4.___% Complete (Subtests 1, 2, 3 & 4 constitute 33% of required MP testing and should be included in 5.d.).
      5. ___%, 6.___%, 7.___%, and 8.___% Complete (Subtests 5, 6, 7, and 8 constitute 33% of DB testing and should be included in 5.D.).
      9.___%, 10.___%, 11.___% Complete (Subtests 9, 10 and 11 constitute 10% of required RF testing and should be included in 5.B.).
6. Test Schedule:
   A. Total (SI or SS) Test Hours Planned

* Not required for SS test reports

\+ Not applicable to FDP only Test Reports.

B. Total Test Hours Completed to Date
C. Total SI (or SS) Test Days Planned
D. Total Test Days Completed to Date

7. Resource Utilization:
   A. Estimated Man Hours to Date:
      1.) Test Preparation:
      2.) Test Conduct:
      3.) Test Analysis and Documentation:
   B. Estimated Computer Hours:
      1.) Test Preparation: Simplex Duplex
      2.) Test Conduct: Simplex Duplex Triplex
      3.) Test Analysis and Documentation: Simplex Duplex Triplex
8. Comments/Problems:
   Describe all significant problems or accomplishments.
9. Name and Title.

SI TEST SUMMARY

TEST I.D.	A Built Flight Data	B Console Data Terminal (CDT)	C Supervisory I/O	D Interface (NAS/ARTS etc.)	E Teletype Interface	F System Interactions	G Maintenance Procedures	H Routine Procedures	I Recovery Procedures	J Transition Procedures	K Data Base Maintenance	L EART ERAM SUPPORT SYS.	M Active Inputs and PVD Outputs	N Surveillance System Adaptation	O Operating Procedures	P Personnel Proficiency	Q Tracking	R System Monitoring (M/S/P)	S System Capacity
Routine Functions																			
RF-60.1 Test Bed Stab.								X										X	
RF-60.2 Prof. Devel.													X			X			
RF-60.3 Validate for ATC						X		X							X			X	X
RF-61 PVD SYSTEM						X							X		X				
RF-62 I/O MSGS	X	X		X	X								X						
RF-63 PVD OUTPUTS																			
RF63.1 Data Symbology	X			X										X			X		
RF63.2 Map Data													X						
RF63.3 WFMU													X						
RF64 RADAR PROCESSING																			
RF64.1 TRACKING														X			X		
RF64.2 ACQUISITION	X													X			X		
RF64.3 HANDOFF				X										X			X		
RF64.4 TRACK LOSS														X			X		
RF64.5 TRACK SWAP														X			X		
RF64.6 TRACK DEVIATION														X			X		
RF-65 CONSOLE DATA TERM. (CDT)	X		X		X	X												X	
RF-66 BANS SYSTEM					X	X		X	X				X			X	X	X	

ATTACHMENT 7

SI TEST SUMMARY

TEST I.D.	A Bulk Flight Data	B Console Data Terminal (CDT)	C Supervisory I/O	D Interface (NAS/ARTS etc.)	E Teletype Interface	F System Interactions	G Maintenance Procedures	H Routine Procedures	I Recovery Procedures	J Transition Procedures	K Data Base Maintenance	L EART CNL SUPPORT SYS.	M RETLR Inputs and PVD outputs	N Surveillance System Adaptation	O Operations Procedures	P Personnel Proficiency	Q Tracking	R System Monitoring (M/S/P)	S System Capacities
TRANSITION PROCEDURES																			
TR-61 START			X	X						X									
TR-62 STOP			X	X						X									
TR-63 FLOP			X	X					X				X						
TR 64 SORE			X	X					X				X						
DATA BASE VALIDATION																			
DB-60 ADAPTED PARAM.											X	X							
DB-61 ADAPT. GENERA.											X	X							
DB-62 DEVICE ADAPT.											X	X							
DB-63 RADAR DATA											X	X		X					
DB-63.1 WFMU MASK											X	X		X					
DB63.2 RADAR DATA COUNT											X	X		X					
DB633 REGISTRATION											X	X		X					
DB-64 BASELINE MAINT								X			X	X							
DB-65 BULK STORE	X										X	X							

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ATTACHMENT 7

SI TEST SUMMARY

TEST I.D.	A Built Flight Data	B Console Data Terminal (CDT)	C Supervisory I/O	D Interface (NIAS/ARTS etc.)	E Teletype Interface	F System Interactions	G Maintenance Procedures	H Routine Procedures	I Recovery Procedures	J Transition Procedures	K Data Base Maintenance	L EART Comm. Support Sys.	M Active Inputs and PVD Outputs	N Surveillance System Adaptation	O Operating Procedures	P Personnel Proficiency	Q Tracking	R System Monitoring (H/S/P)	S System Capacity
INTERNAL FAILURES																			
IF-61 DPS ELEMENT FAIL (S/M)							X	X	X										
IF-62 PVD (S/M)							X	X	X										
IF-63 DVD CED							X	X											
IF-64 CDT (S/M)							X	X	X										
IF-65 MAIN PWR FAIL							X	X	X						X	X			
EXTERNAL FAILURES																			
EF-61 CD/WEMU							X	X											
EF-62 INTERFACE (NIAS/ARTS)							X	X											
MAINTENANCE PROC.																			
MP-61 Prevent. Maint							X	X											
MP-62 Engineering Chg.							X	X											
MP-63 Sys. Certif. (daily)			X				X	X							X			X	
MP-64 Sys Cert (Periodic)			X				X	X							X			X	
MP-65 RADAR Alignm.		X	X				X					X		X				X	
MP65.1 Radar Site							X					X		X					
MP65.2 TGT. POST. ACCUR.							X					X		X					
MP65.3 BCN DATA							X					X		X					
MP65.4 COLL/ALIGN							X					X		X					

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